WATER WORKS & SEWERAGE

ODERN RECORD ROOM OF THE COLLECTION DIVISION OF KANSAS CITY'S WATER DEPARTMENT
(A Public Relations Improver of Note)

CLOUDS OF BACTERIA-LADEN DUST ENDANGERED THE WATER SUPPLY!

On a rush job enlarging a state airport, tractors, trucks, shovels and graders were working 16 hours a day—during the worst drought in the history of the community. As a consequence, thick clouds of bacteria-laden dust drifted almost constantly over two nearby reservoirs, increasing the bacteria count.

The water works engineer proved equal to the situation. He began at once devising means of getting Per*chloro*n into action. Per*chloro*n is a super-test calcium hypochlorite that provides an excellent stand-by source of chlorine. It dissolves readily, is unusually stable and has more than 70% available chlorine. Per*chloro*n has performed vital service in many water supply emergencies.

In the case in question, here is how Per*chloro*n was used. A 1½-ton truck, carrying an air compressor, pump, wooden barrel and high pressure hose, was put into service. A mixture of one can of Per*chloro*n to a barrel of water was sprayed on the surface from the moving truck, or by a man walking along the embankment.

Per*chloro*n at the rate of two or three parts per million was sprayed on the reservoirs twice a week.

RESULT: Low bacteria count—and only three hours time consumed per application.

Per*chloro*n will serve *you* just as dependably in any situation demanding emergency sanitation. During these times much of the Per*chloro*n manufactured is, of course, going into essential wartime needs. That leaves less for our customers and you can help this situation by: *Ordering only for regular current needs —well in advance.*

Penn Salt representatives are experienced in many of the unusual problems that face water works engineers today. Call on them, without obligation, for advice and cooperation. And if you do not have your *free* copy of the valuable booklet on Per*chloro*n, write today to Dept. WWS.

Perchloron

REG. U. S. PAT. OFF.

PENNSYLVANIA SALT MANUFACTURING COMPANY

Chemicals

1000 WIDENER BUILDING, PHILADELPHIA 7, PA.

New York • Chicago • St. Louis • Pittsburgh • Minneapolis • Wyandotte

WATER WORKS & SEWERAGE. August, 1943. Volume 90. Number 8. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under act of March 3, 1879.

Hair-Splitting Exactitude . . .

Zeiss Toolmaker's Microscope being used for checking dimensions of newly purchased tap against accurate thread form standards.

TO 1/100,000 OF AN INCH !

PRECISION DIMENSIONAL CONTROL ASSURES ACCURACY AND LONG LIFE

in PITTSBURGH-NATIONAL WATER METERS

A human hair is approximately 3/1000 (.003) of an inch thick. Imagine, if you can, splitting a hair into 300 equal parts and being able to measure each individual subdivision. This graphic example is used to illustrate the almost infinitesimal dimensional measurement that is accomplished every day in the Standards Department of the Pittsburgh Equitable Meter Company.

This department, which developed out of the normal demand for manufacturing accuracy in volume production, was originally installed in 1937 and has been greatly expanded since. Many of this company's achievements in handling wartime projects would have been impossible without the dimensional exactness that is provided through our Standards Department. *We have recently been awarded the "A" rating of the Army Air Forces for quality control.*

Accuracy in the performance of meters made in large production is of necessity dependent upon the accuracy of the tools, jigs and gages that guide the machining and assembly procedures. The hair-splitting exactitude to which these manufacturing appurtenances are held by Standards control assures an accurately made and fitted product, capable of a long and useful life.

PITTSBURGH EQUITABLE METER COMPANY

BOSTON · BROOKLYN · BUFFALO · CHICAGO · COLUMBIA · HOUSTON · KANSAS CITY

MERCO NORDSTROM VALVE COMPANY
Main Offices, Pittsburgh, Pa.

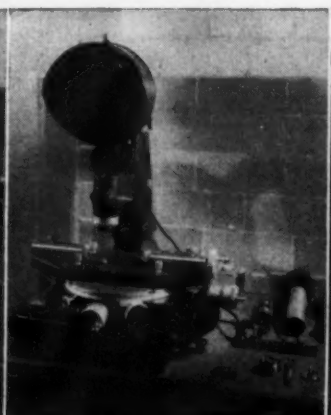
LOS ANGELES · MEMPHIS · NEW YORK · PITTSBURGH · SAN FRANCISCO · SEATTLE · TULSA

NATIONAL METER DIVISION, Brooklyn, N. Y.

INVEST TODAY IN BONDS FOR VICTORY

...ral View of Equipment in Standards Room. These quarters are ...ditioned to assure normalcy while tools, gages and parts are tested.

Jones and Lamson Pedestal Comparator and Measuring Machine being used to check a tap for wear after service.



The Zeiss Toolmaker's Microscope in use checking a production part for correct contour against the standard outlined on the projection screen.

Pratt and Whitney Measuring Machine. The Micrometer Graduated Drum reads directly to 1/100,000 of an inch.

WHEN A MATHEWS TAKES A HIT COMPLICATIONS ARE OUT . . . !

Mathews Hydrants stand up under easy hits like no other hydrant team. There's no sacrificing of strength—no weak point to take the blow. If it's a smashing home run wallop that no hydrant can take, you simply send in a complete new barrel to substitute. Hit and run plays are out, too, because any car that hits a Mathews hard enough to snap it off stays around long enough to pay the bill. Mathews Hydrants lead the league in all-around performance. Give your community the benefit of their many advantages.

Write for complete information.

MATHEWS HYDRANTS

400 CHESTNUT STREET, PHILADELPHIA, PA.

ESTABLISHED IN 1803

Made by R.D. WOOD Company

MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

In re: Fittings

ar-dipping a large cast iron fitting, drawn by Hugh Ferriss.

Today, the design and manufacture of standard and special cast iron fittings for water, gas and sewage lines is a specialized art in the modern pipe foundry. In fact, we operate a specialized plant, recently modernized and enlarged, for the manufacture of fittings. Progress in the art has been considerable as a result of years of product research, conducted independently in our laboratories as well as cooperatively with various engineering groups. If you have a problem in pipe design and fittings our technical staff is at your service.

UNITED STATES PIPE & FOUNDRY CO.

General Offices: Burlington, New Jersey. *Plants and Sales Offices throughout the U. S. A.*

THESE ARE THE GUNS OF PEACE

Public works such as parks and post offices, highways and bridges, may be desirable but *public works affecting the public health*—water works and sewage works construction—are clearly indispensable. Needed improvements and extensions, and even repairs, to these vital public services have been and are still being postponed. The same applies to utilities supplying gas for cooking, heating and other domestic purposes. Yet cast iron pipe, a standard material for water, gas and sewer mains, is available now with priorities, and will be available immediately and in large quantities after the war. For, while our members worked at full capacity in producing pipe for war projects, and are still producing a large amount of war material with special equipment, their pipe shops remain intact and will not require conversion when the war ends.

* * *

Really useful and important public works, such as water, gas and sewerage construction, sewage treatment plants and water purification plants, will create quick and widespread employment. Such construction should be

They shoot water through city streets to bathroom faucets—gas to kitchen ranges—influent to sewage treatment plants. Ample stocks in the pipe yards of our members are now available but only with proper priorities until the Guns of War are silenced.

resumed as soon as possible, and certainly without delay after the cessation of hostilities. Without delay means that *detailed plans must be ready* when the last gun is silenced.

* * *

Any of the members of this Association will furnish promptly information and advice in the preparation of specifications taking full advantage of the greater economy and efficiency of cast iron pipe made in accordance with the new A.S.A. Law of Design*—pipe scientifically designed for your specific service requirements.

**Send for booklet entitled "Manual For The Computation Of Strength And Thickness Of Cast Iron Pipe—Approved by American Standards Association" explaining the principles and methods which are the basis of the new A.S.A. Law of Design.*

RESEARCH ASSOCIATION, CHICAGO

CAST IRON

NO. 1 TAX SAVER

BEST DRESSED MEN IN THE WORLD

YOU don't need any introduction to these men — they're your sons, your brothers, your neighbors' boys. Fighting for you — for America — with the finest equipment and materials America can give them. That includes both equipment you see and equipment you don't see.

Take sanitation materials, for instance. Mathieson HTH is going out in great quantities to help assure our troops of pure drinking water — overseas — on shipboard — in training camps.

Take their uniforms — and blankets, tents and parachutes. Millions of units of sturdy textiles are needed to equip our armed forces. Thousands of tons of chlorine are used in bleaching these materials — and that's where a big supply of Mathieson chlorine goes.

And their planes, tanks and munitions — the best that America can supply. Mathieson Chemicals fill many a vital need in their manufacture. Mathieson chlorine helps in the production of warplane cowlings, high octane gasoline, explosives, cooling agents for liquid-cooled engines, and certain types of synthetic rubber. Mathieson soda ash is required in the making of explosives, aluminum, iron, steel and war-essential glass. Other war needs consume large amounts of Mathieson caustic soda, ammonia and carbon dioxide.

We here at The Mathieson Alkali Works are doing our best to supply essential civilian needs too, but the needs of the armed forces come first. The War Production Board now controls distribution of calcium hypochlorite (Sanitation HTH), giving the armed forces first call on available supplies. You wouldn't wish it to be otherwise — the men in our country's armed services deserve our whole-hearted support!

MATHIESON Sanitation HTH

THE MATHIESON ALKALI WORKS (INC.), 60 EAST 42nd STREET, NEW YORK, N.Y.

LIQUID CHLORINE . . . SANITATION HTH . . . HTH BLEACH . . . SODA ASH . . . CAUSTIC SODA . . . BICARBONATE OF SODA . . . AMMONIA, ANHYDROUS and AQUA . . . PH-PLUS (FUSED ALKALI) . . . DRY ICE . . . CARBONIC GAS . . . SYNTHETIC SALT CAKE . . . SODIUM CHLORITE PRODUCTS

Why Chicago-Equipped Sewage Plants Operate Successfully

1 **OPERATION DATA** compiled from more than a hundred existing Chicago-equipped Activated Sludge Plants is available to consulting Sanitary Engineers.

2 **SPECIALIZED EQUIPMENT** developed by the Chicago Pump Co. for the Activated Sludge Process, and for automatic, trouble-free handling of sewage in all types of plants includes the following: Chicago Wide-Band Air Diffusion Systems, Combination Aerator-Clarifier, Comminutor, Flush-Kleen and Scru-Peller.

3 **APPLICATION** of Chicago equipment is based on data compiled over a period of ten years of constant research and development operations, both in the laboratory and in the field.

4 **INSTALLATION** of Chicago equipment is supervised by experienced Chicago Pump Company erection engineers.

5 **OPERATORS** are trained to produce a consistently high degree of purification, under widely varying sewage flows and strengths, by Chicago Pump Company Operating Sanitary Engineers. They have definite knowledge of process control and plant regulation, based on ten years experience.

Ask For Our Literature on the Activated Sludge Process

CHICAGO PUMP COMPANY

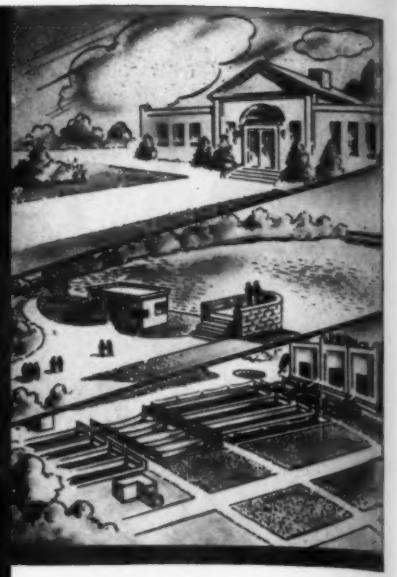
SEWAGE EQUIPMENT DIVISION

2300 WOLFRAM STREET — **CHICAGO, ILLINOIS**

Electric Pumps: Circulating, Bilge, Scru-Peller, Flush-Kleen, Plunger, Fire, House, Condensation, Vacuum.

Swing Diffusers, Stationary Diffusers. Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

Check List of HOOKER CHEMICALS *for* WATERWORKS AND SEWERAGE



PRODUCT *Chemical Formula* *Molecular Weight*	DESCRIPTION	USES	SHIPPING CONTAINERS
Bleaching Powder $CaO \cdot 2\,CaOCl_2$ $3H_2O=364.1$	White powder with chlorine odor	Water Purification Slime Control Sewage treatment Germicide General Disinfectant	Drums containing 100, 300 and 800 lbs.
Caustic Soda $NaOH=40.0$	White deliquiscent solid	Softening Water	Drums containing 100, 220, 400, 700 lbs. and Tank cars
Chlorine, Liquid $Cl_2=70.90$	Orange liquid or greenish yellow gas	Water Purification Sewage treatment General Germicide Slime Control	Cylinders containing 100 and 150 lbs. Drums containing 2000 lbs. and Tank cars containing 16 and 30 tons
Ferric Chloride Solution $FeCl_3=162.2$	Dark red syrupy liquid	Sewage Treatment	12-gal. carboys containing 50 lbs. and Tank cars

SAVING A SOLDIER'S LIFE is a job for such uniformly high quality chemicals as HOOKER Chlorine used in the manufacture of anti-malarial and Sulfa drugs.

SAVING A CHILD'S LIFE is a job for this same HOOKER product when used by waterworks engineers to prevent water-borne disease.

SAVING A NATION'S LIFE is a job for *all* of us. All of us can help by buying U. S. War Bonds every pay day—and up to the very limit of our capacity.

Heading this checklist are HOOKER'S earliest products, Bleaching Powder and Caustic Soda, two standbys widely used by municipalities for many years. Used in connection with water systems and sewage systems, they have been accepted as a standard of uniformly high quality.

From these two chemicals, the HOOKER group of products has grown to a hundred, including Liquid Chlorine and Ferric Chloride Solution. Write for more detailed information on any of the products mentioned on this page. Ask for list "W9".

HOOKER ELECTROCHEMICAL COMPANY

NIAGARA FALLS, NEW YORK

New York, N. Y. Tacoma, Wash. Wilmington, Calif.

ARMY E NAVY

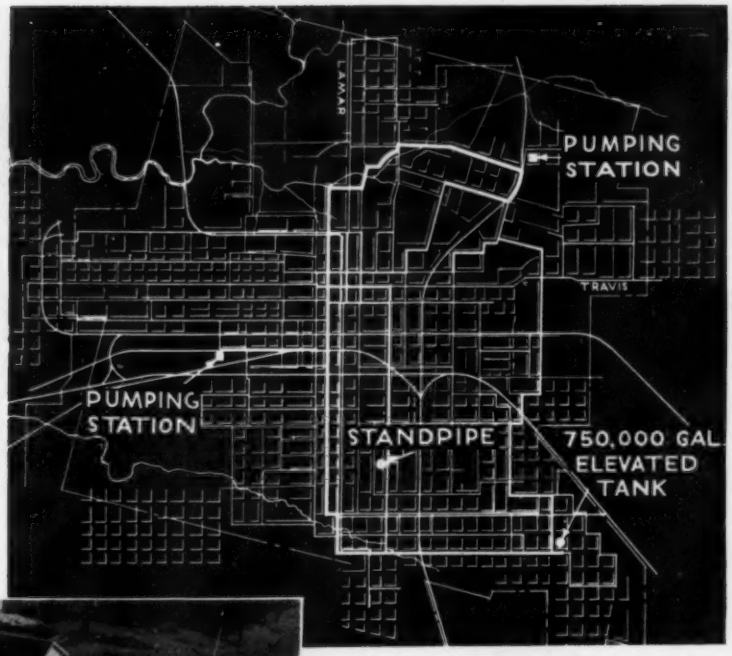
HOOKER ELECTRO CHEMICAL COMPANY

HOOKER CHEMICALS

4242

Here's a new angle ...on the value of—

Elevated Storage



THE 750,000-gal. elevated tank at the left forms an important part of the water supply system at Sherman, Texas. This city pumps its water from ten wells. The supply passes from the wells through a 30,000-gal. settling tank into a 1,500,000-gal. reservoir. From there it is pumped into the distribution system.

The elevated tank, together with a standpipe, the locations of which are shown on the above map of the system, maintain a relatively uniform pressure in the mains and help take care of the variations in demand.

The 750,000-gal. tank is a standard radial-cone structure, 58 ft. to bottom and has a range of 30 ft. between the low and the high water levels. Tanks of this type have built in capacities of 2,000,000 gals. with as little at 25 ft. range in head.

ARMY (E) NAVY

. . . Awarded to our shipyard at Seneca, Ill., and dry dock yards at Eureka, Calif., and Newburgh, N. Y.

CHICAGO BRIDGE & IRON COMPANY

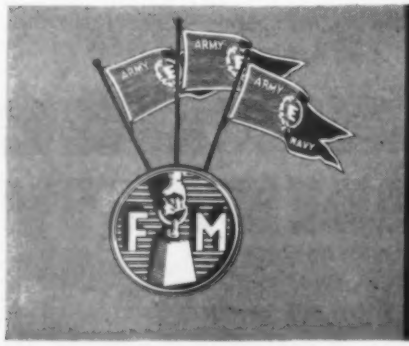
Chicago 4.....2193 McCormick Building
New York 6.....3390-165 Broadway Building
Cleveland 15.....2262 Guildhall Building
Havana.....402 Edificio Abreu
Birmingham 1.....1596 North 50th Street
Tulsa 3.....1646 Hunt Building
Houston 1.....5615 Clinton Drive
Philadelphia 3.....1644-1700 Walnut Street
Washington 5.....330 Bowen Building
San Francisco 9.....1083 Rialto Building

FAIRBANKS-MORSE TURBINE PUMPS

The F-M line offers complete range of capacities from 35 g.p.m. to 4000 g.p.m., for electric motor, Diesel or gasoline engine, or steam turbine drive. Open or closed impellers. Oil or water lubrication.

A SUDDEN boost of 10 per cent in power rates? You'd call it ridiculous—but many ten-year-old pumps of certain types, *even if as good as new,* take 10 per cent greater toll at the meter than today's Fairbanks-Morse models! And a 10 per cent reduction in power consumption is anything but ridiculous—especially now.

Before you arrange for increased power to meet heavier production schedules, eliminate power waste. Your resident Fairbanks-Morse Engineer can tell you quickly—without cost or obligation—whether or not the pumps you have are the types that exact the penalty of obsolescence. You may discover, as others have, that new pumps would solve your power problem today—and your cost problem tomorrow. Use your priority to buy for today with an eye on tomorrow's cost sheets. Write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Illinois.



FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
SCALES

WATER SYSTEMS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS
RAILROAD EQUIPMENT

F M

Pumps

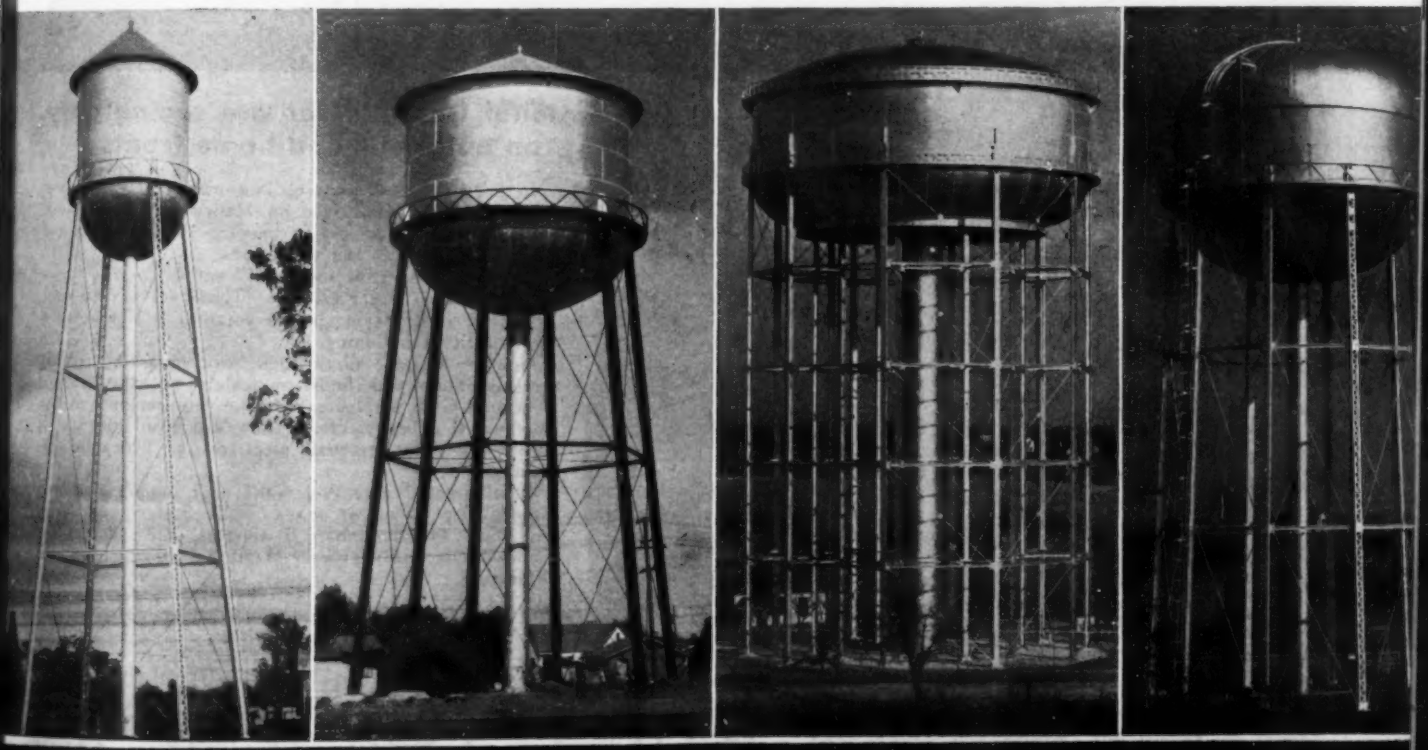
for the Duration—

USE THIS SIMPLE EQUIPMENT TO HELP ASSURE CONTINUED BEST SERVICE FROM YOUR

ELEVATED STEEL TANKS

by PITTSBURGH DES · MOINES

Keep its protective coating intact, and your elevated tank will last for many years! Now, more than ever before, the simple paint maintenance that gives maximum life to steel is a conservation duty for every municipality. To help in this necessity, we will gladly supply paint specifications for your local riggers and painters, and any needed advice as to procedure, without charge. Write!



PITTSBURGH · DES MOINES STEEL CO.

PITTSBURGH, PA. 3418 NEVILLE ISLAND — DES MOINES, IOWA, 919 TUTTLE STREET
NEW YORK, ROOM 918, 270 BROADWAY • CHICAGO, 1222 FIRST NATIONAL BANK BUILDING
DALLAS, 1223 PRAETORIAN BUILDING • SAN FRANCISCO, 625 RIALTO BUILDING
SEATTLE, 1126 EIGHTH AVENUE, SOUTH

FOR SERVICE ON LAND AND SEA

In the illustration above, a highly skilled National workman makes a final check of high pressure steel valves for Kaiser ships. Operation must conform in every detail to rigid National standards of performance.

Boring mill operator puts a finishing touch on the body of a National Gate Valve.

National Gate Valves are seeing duty on both war and home fronts

In the front rank you see National steel valves for high pressure steam lines on Henry Kaiser's ships—destined to play a part in keeping ships moving and supplies flowing to the war zones.

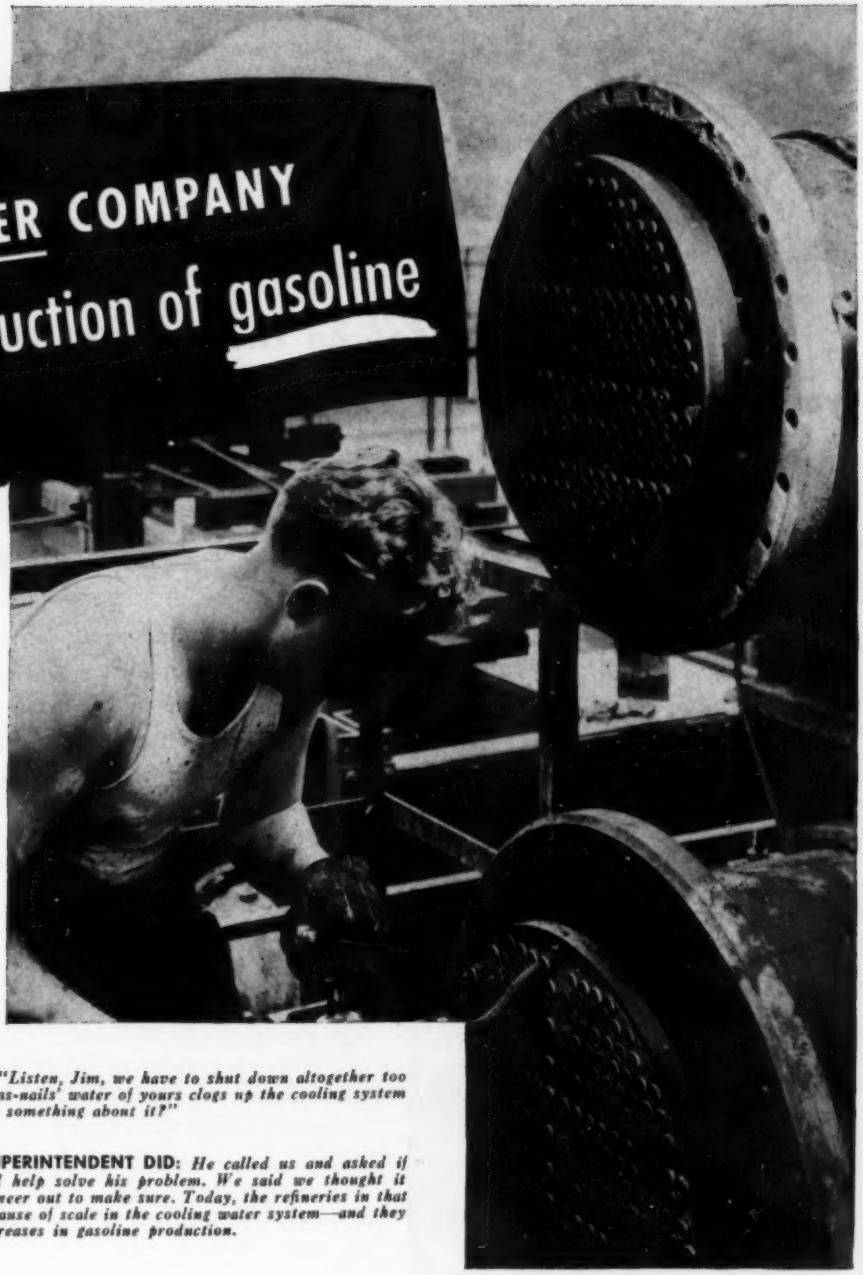
In the second row, husky 24" valves for the water mains of the City of Chicago. These valves will contribute a vital service in the complex job of keeping a great city functioning.

Sound design, meticulous workmanship, sturdy cross-sections and finest materials are the reasons National Gate Valves satisfy the requirements of the most critical engineers. They are available in all usual types for manual, electrical or hydraulic operation.

If the gate valve you want isn't among National standard patterns or sizes, we'll design and build to your specifications. Estimates and engineering counsel cheerfully given. Write for information and literature.

NATIONAL
MACHINE WORKS
1559 North Sheffield Avenue Chicago, Illinois

HOW A WATER COMPANY stepped up production of gasoline



REFINERY MANAGER: *"Listen, Jim, we have to shut down altogether too often because that 'hard-as-nails' water of yours clogs up the cooling system with scale. Can't you do something about it?"*

WHAT THE WATER SUPERINTENDENT DID: *He called us and asked if Calgon Treatment would help solve his problem. We said we thought it would—and sent an engineer out to make sure. Today, the refineries in that city never shut down because of scale in the cooling water system—and they have had substantial increases in gasoline production.*

CALGON is one treatment that will control corrosion, prevent scale, eliminate "red water" or stabilize water after lime-soda softening. *No new problems are introduced as a result of Calgon Treatment!*

Only 0.5 to 10 ppm. Calgon are needed to accomplish any of these effects. This keeps the cost extremely low. You can start Calgon Treatment immediately. No waiting for elaborate equipment. Only a simple feeding mechanism is required.

Industrial plants need never shut down because of scale in heat exchangers and condensers. Home owners need never suffer with clogged-up water heater coils. In Calgon* you have a treatment that will keep your industrial and domestic customers' equipment operating in A-1 condition. Get the facts now.

Calgon solves 4 water works problems

1. **Prevention of scale** from hard, high-bicarbonate waters. Calgon, added at the plant, prevents scale formation in mains, meters and hot-water heaters, throughout the system.

2. **Corrosion control**—Calgon forms a thin protective film on metals and metal oxides at pH values of 5.0 and higher. This reduces the attack of oxygen to such an extent that corrosion ceases to be a problem.

3. **Prevention of "red water"**—Calgon prevents the precipitation of dissolved iron. Thus "red water," either from iron initially present in well water, or from corrosion, can be eliminated.

4. **Stabilization of water** following lime or lime-soda softening. Calgon's ability to prevent precipitation of calcium carbonate stabilizes water to the ends of the system.

*Calgon is the registered trade-mark of Calgon, Inc., for its glassy sodium phosphate products.

HAGAN HALL BUROMIN CALGON

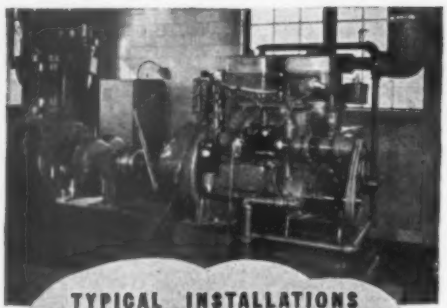
calgon, inc.

A SUBSIDIARY OF HAGAN CORPORATION

HAGAN BUILDING PITTSBURGH, PA.

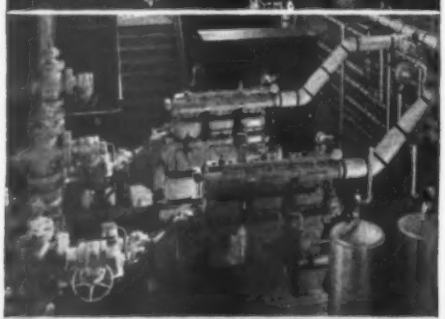
Yes, **on the basis of their performance records, you'll get lower costs and more dependable power with . . .**

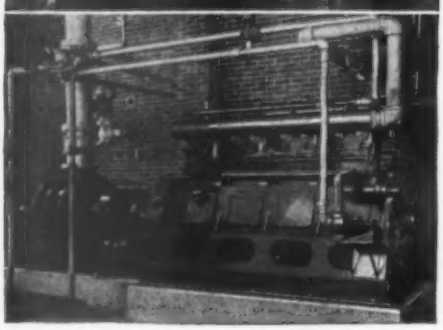
Climax SEWAGE GAS Engines



TYPICAL INSTALLATIONS

• These photographs show Climax Engines at work in typical sewerage plants, giving superior performance while operating on by-product gas.





Right Now, your plant can produce from sewage gas an average of 1 horsepower hour for every 17 persons served. For a city of 50,000 you can produce 2,900 hp-hr. every day. If you are serving 100,000 people your sewage gas has a cash value of $17,000 per year, if converted into energy by Climax Sewage Gas Engines.

Here are Additional Facts to Consider . . .

YOU CAN MAKE POWER in your plant at far less cost than you can buy it.

You can get all the energy you need from your sewage gas to pump the sewage—illuminate the buildings and grounds—furnish heat for buildings and digesters—and operate all auxiliary mechanisms.

YOU CAN END STOPPAGES due to outside power failure. Records show 24-hour operation year after year without failure—providing nominal maintenance requirements are met.

YOU CAN GET SAFE POWER. Hazards from explosions are removed with standard flame traps, shut off valves, etc. Ample ventilation prevents accumulation of methane.

YOU CAN MODERNIZE old plants with Climax Engines in place of electric motors, and the improvements pay for themselves in a short time.

By harnessing this power from waste you create an additional national asset of particular importance under present war conditions.

Another gain, often evaluated higher than the thousands of dollars saved, is the local goodwill inspired and the credit you earn as an alert, public-minded engineer.

At present, the bulk of Climax Engines is being furnished to the armed forces, and high priorities are required for purchase. It is suggested that you write to Dept. K, Climax Engineering Co., Clinton, Iowa, and state your requirements.

INSTALLATIONS . . .

1. A 43 hp. Climax Sewage Gas Engine direct-connected to a Connersville Blower at Two Rivers, Wisconsin.

2. Two 50 hp. Climax Sewage Gas Engines connected to DC generators and two Climax 75 hp. Engines connected to pumps at Aurora, Illinois.

3. Two 75 hp. Climax Sewage Gas Engines direct-connected to Connersville Blowers at Marion, Indiana.

4. A 100 hp. Climax Sewage Gas Engine direct-connected to blower at Belleville, Illinois.

SEND FOR CLIMAX ENGINE BULLETINS

These bulletins, each covering a single Climax Engine, contain complete yet compact information on uses, ratings, design, construction, maintenance, specifications.

"For High Achievement in the Production of War Material"

Climax Engineering Company

GENERAL OFFICES & FACTORY

CLINTON, IOWA

REGIONAL OFFICES: CHICAGO, ILL., DALLAS, TEXAS

HOW TO MAKE YOUR LIQUID CHLORINE GO FARTHER...

a) Consult with Diamond Technical Service regarding your procedure in using liquid chlorine. You may discover an unsuspected means of extending your liquid chlorine, or achieving greater efficiency in its use.

b) Insist on getting liquid chlorine that is uniform and free from unwanted impurities, and comes to you in containers that best meet your requirements. In this way you can make full use of every ounce of your supply.

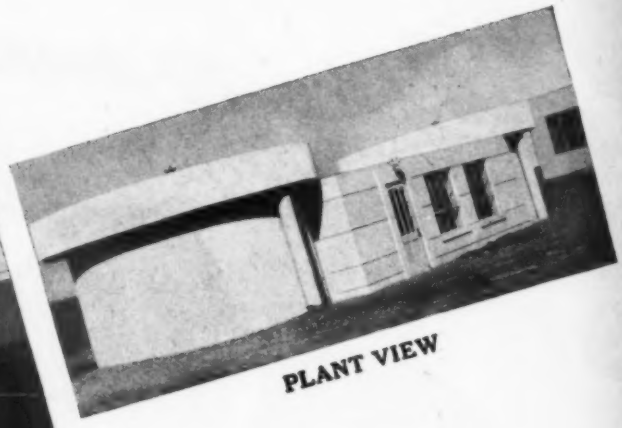
ALKALI

DIAMOND ALKALI COMPANY

PITTSBURGH, PA. and Everywhere

American Ferrofilters

PLANT OPERATION



PLANT VIEW

Removes iron, manganese, CO_2 and other dissolved gasses and odors.

Backwashing insures uniform efficiency and eliminates renewal of clogged media.

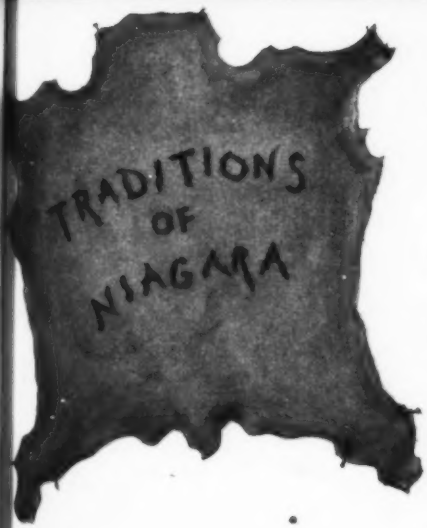
Expensive chemical treatment and sand filters eliminated.

Lowest initial and operating costs.

SEND FOR BULLETIN No. 252

NEW BULLETINS AVAILABLE

Grit Removal Design ..... No. 249	Mixing Equipment ..... No. 255	Screens ..... No. 258
Sludge Removal ..... No. 253	Flocsettler ..... No. 256	Centrifugal Pumps ..... No. 251
Aeration Equipment ..... No. 254	Rotary Distributors ..... No. 257	Iron and Carbon Dioxide Removal... No. 252



An Essential Part Of America's Great Chemical Enterprise

"The Red Man's Fact.."

For centuries before the discovery of America, Niagara Falls was the crossroads of Indian trade routes and the subject of many primitive myths and legends. Later these came to be called "the red man's fact and the white man's fancy."

Today, Niagara is the hub of vastly greater trade routes and the source of power more fantastic in fact than anything ever dreamed in the red man's fancy. For it is the center of a huge electro-chemical industry from which America derives much of its strength.

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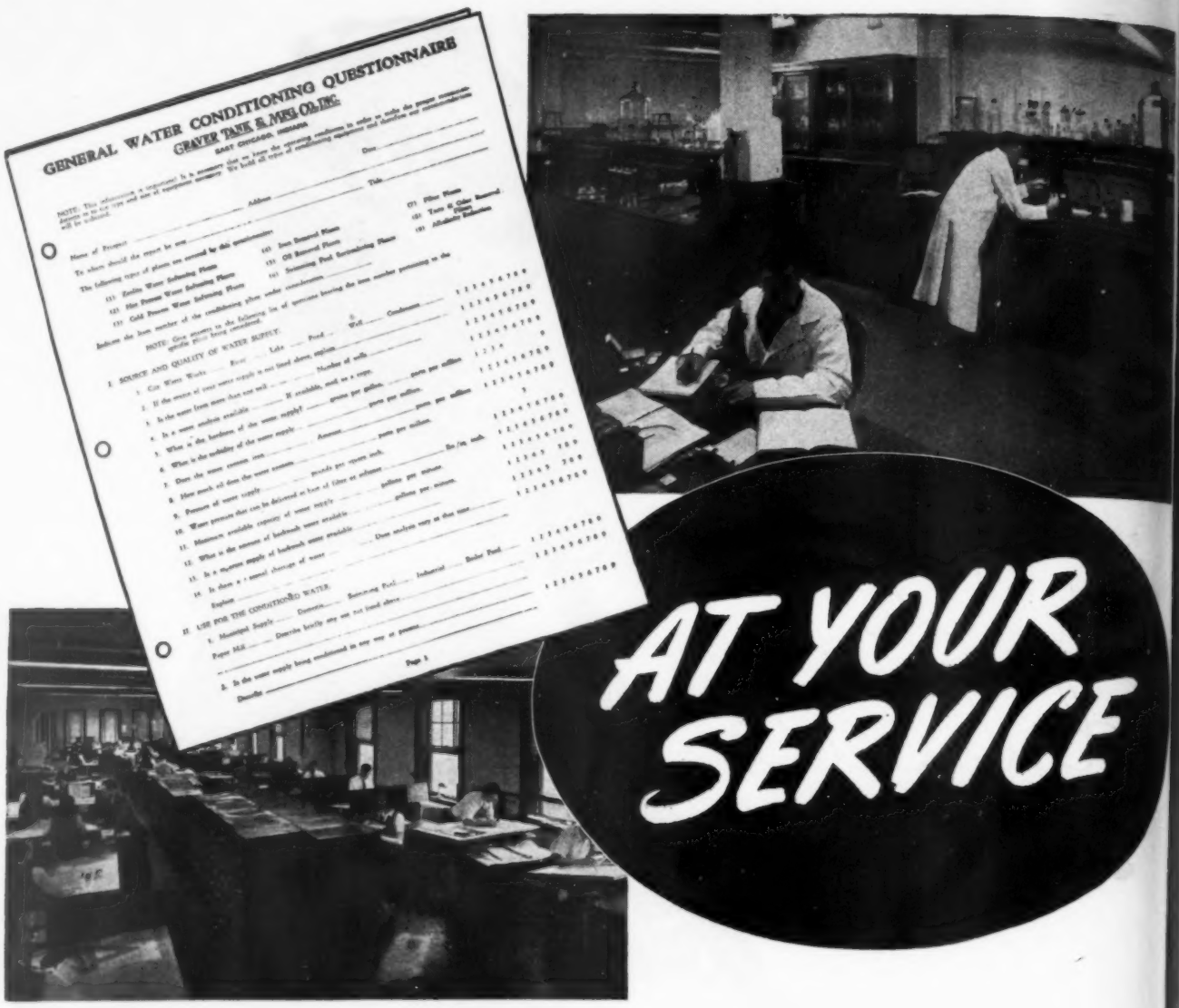

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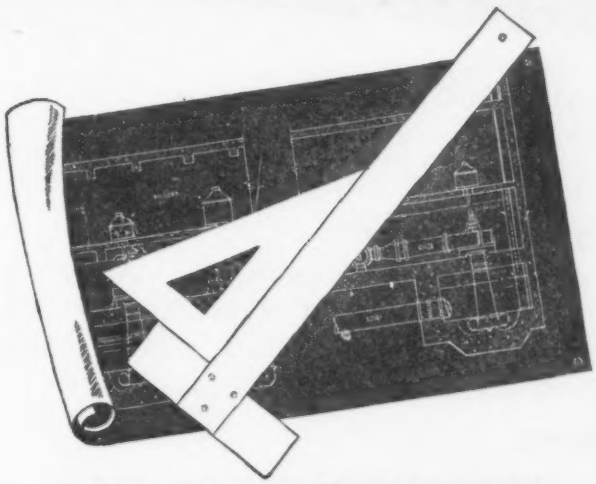

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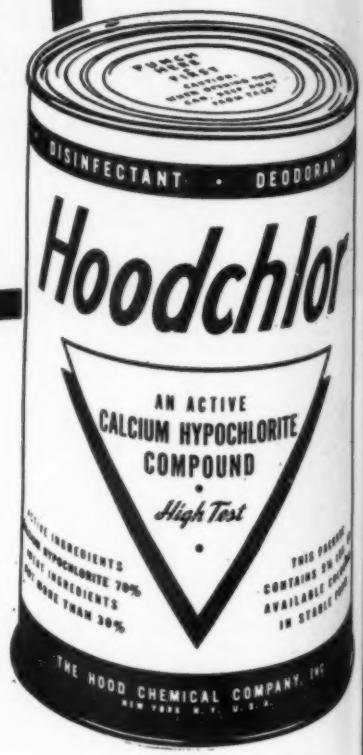

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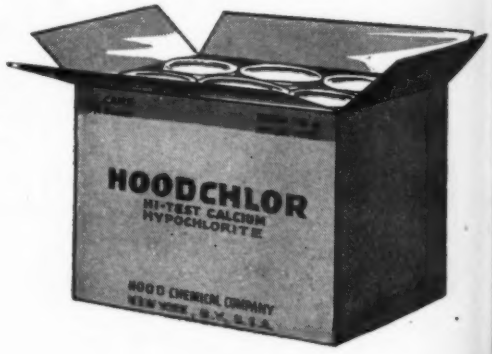

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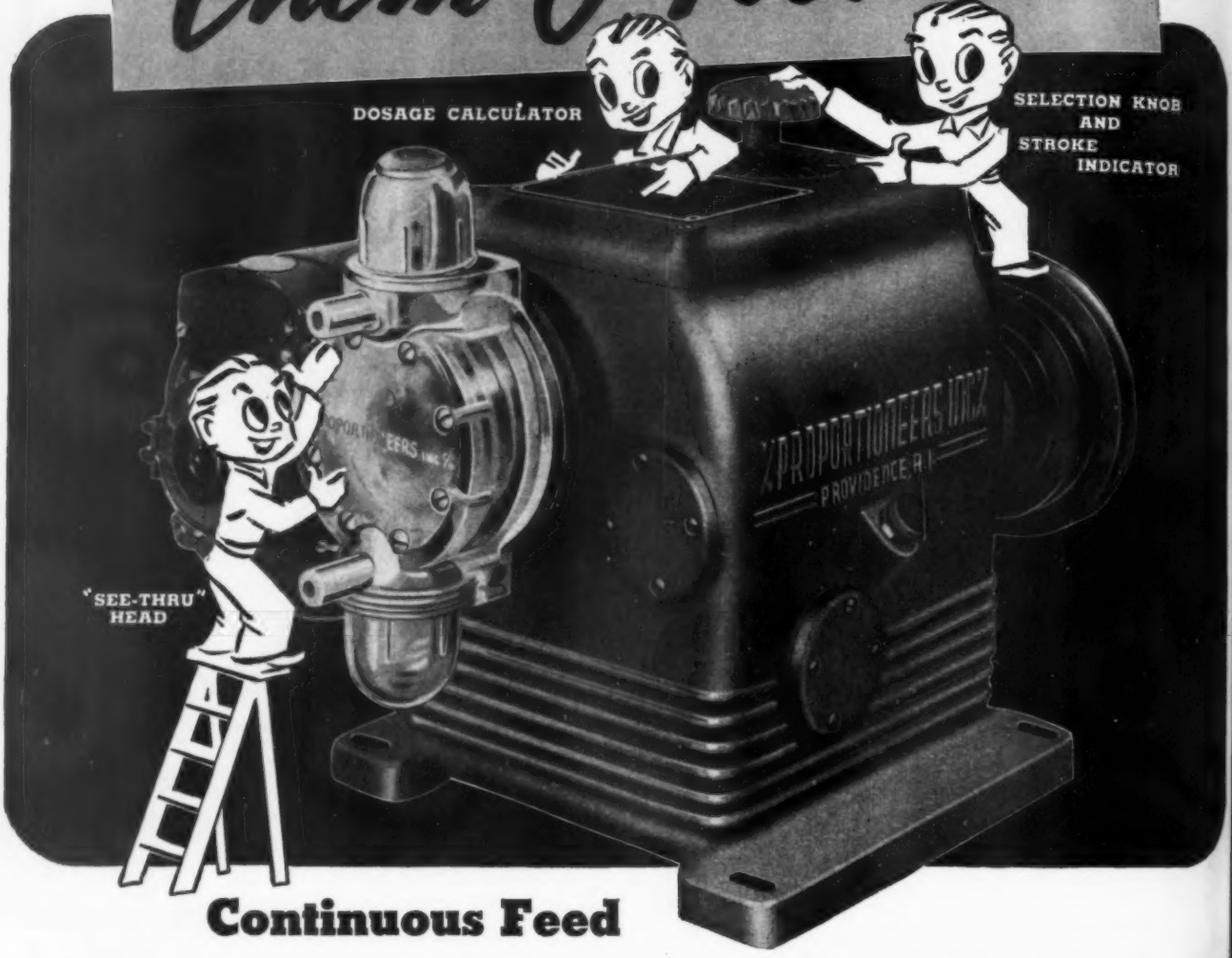

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COMING!

"The Sewage Plant of Cokato"

On the front cover of our February issue appeared the picture of the interesting small town plant of Cokato, Minn., as a "Main St. Plant of 1942." This novel, compact and attractive-appearing plant under one roof is now to be described. The same article will reveal the unique and economical method of treating corn-canning wastes through waste impounding in a lagoon and purification by recirculation through a high-rate, high-capacity trickling filter and eventual dumping of the purified lagooned waste. The author and plant designer is—

W. E. KING, Consulting Engineer,
Toltz, King and Day Engrs., St. Paul, Minn.

"Wartime Meter Repairing"

Is a discussion of the repairing and testing of water meters under wartime conditions but the article will emphasize a method developed for the grinding in of measuring chambers and disc pistons which has proven of marked value in the saving of materials and even whole meters heretofore considered non-repairable. The author, who needs no introduction to most of our readers, is—

LAVERNE TRENTLAGE,*
Supt. of Meters, Elgin, Ill.

*One of the A.W.W.A. prize winners in the Supt's. papers contest.

"Sewage Works Financing and Joint Billing"

Is a contribution which outlines the method of arriving at sewer service charges, involving a rate structure somewhat different from most methods of charging and billing for such service, by a medium sized city which employs joint billing for water and sewer service but maintains separate accounts for each. The author is—

JOHN A. GOETZ, Supt.,
Water and Sewerage Department, Mattoon, Ill.

"The Miller Magnetic Pipe Locator"

Is an ingenious instrument which any water works man can construct. It is described and its use in simplified location of underground pipe lines, valve boxes, conduits, etc., is explained by the inventor—

BASIL MILLER,
Supt. of Utilities, Fennimore, Wis.

"Sewerage Financing and Maintenance Practice"

In Little Rock, Arkansas, is the interesting story of—

T. W. CLAPHAM, Manager,
Little Rock (Ark.) Sewer System.

"Some Notes on Water Main Construction"

Is a contribution, containing a number of valuable pointers and observations, from—

WALTER HORN, Engineer,
Bureau of Water, Allentown, Pa.

"Operating Logs and Record Forms for the Small Water Plant"

Represents a composite presentation of log and record forms considered meritorious by representatives of the State Health Departments, two of whom are former plant operators. Another article on this same topic and a recommended operating record form for small plant use is the contribution of—

A. A. HIRSCH, Director,
Louisiana Sectional School on Water Supply and Sewerage.

"Control of Corrosion"

Was the subject of the last paper prepared by the late Robert Spurr Weston, the well known and beloved pioneer in sanitary engineering in America. We shall reproduce Mr. Weston's paper on this subject, so close to his heart, as his final contribution to the technical literature.

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That is why your post-war planning should include your meter shop. It is not too early to look into the modernization of testing equipment. The layout of the shop is also important. The proper arrangement of the necessary work benches, parts-bins, testing bench, etc. will enable the meter man to do a better job. An efficient meter shop need not be elaborate nor expensive . . . but remember that it is the heart of the metering end of your water system; and it will pay you to plan it carefully.

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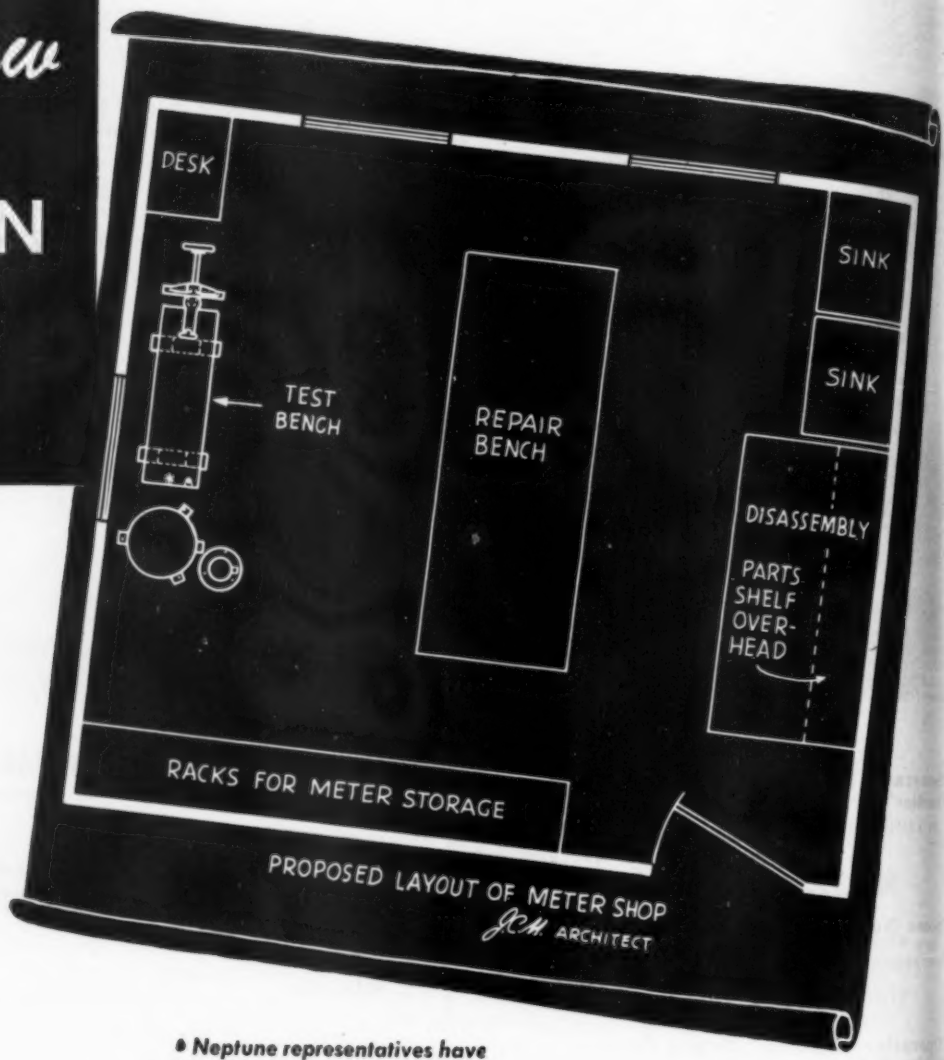

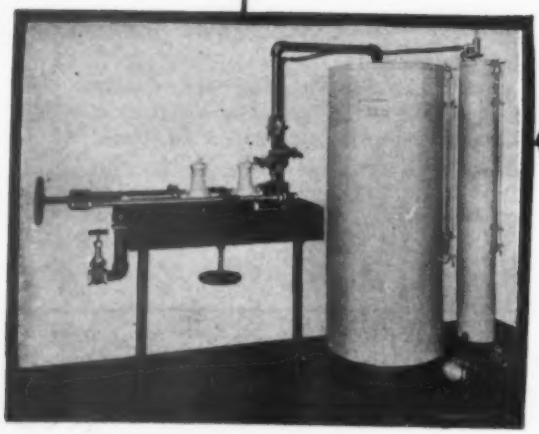

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WATER WORKS & SEWERAGE

VOL. 90, No. 8 *A Gillette Publication* AUGUST, 1943

A SIMPLIFIED FLOW RECORDER FOR PARSHALL FLUMES

Developed for Purpose of Recording Flows Over Extended Range

By JOHN D. SLOUGH
Superintendent of Sewage Treatment
WELLSVILLE, N. Y.

The Author

THE Wellsville Sewage Treatment Plant was completed and placed in operation late in November 1937. Construction was financed by a Village bond issue, for a sanitary sewer system, three pump stations and a treatment plant, totaling $355,000.00.

The plant was designed by the Wm. S. Lozier Co. of Rochester, N. Y., and built by a local contractor, Mr. L. C. Whitford, at a cost of approximately $92,000.00.

Sewage is received through a twenty-two inch trunk sewer and flows by gravity through the plant where it is given primary treatment with plain sedimentation and separate multi-stage digestion. It then flows into the Genesee River through a twenty-two inch outfall.

The plant was designed for a tributary population of 9,000 but the present population served is about 5,500. It was intended that the plant treat sewage from a separate sewer system, but because of sewer system construction difficulties and storm water from several sections not served by storm sew-

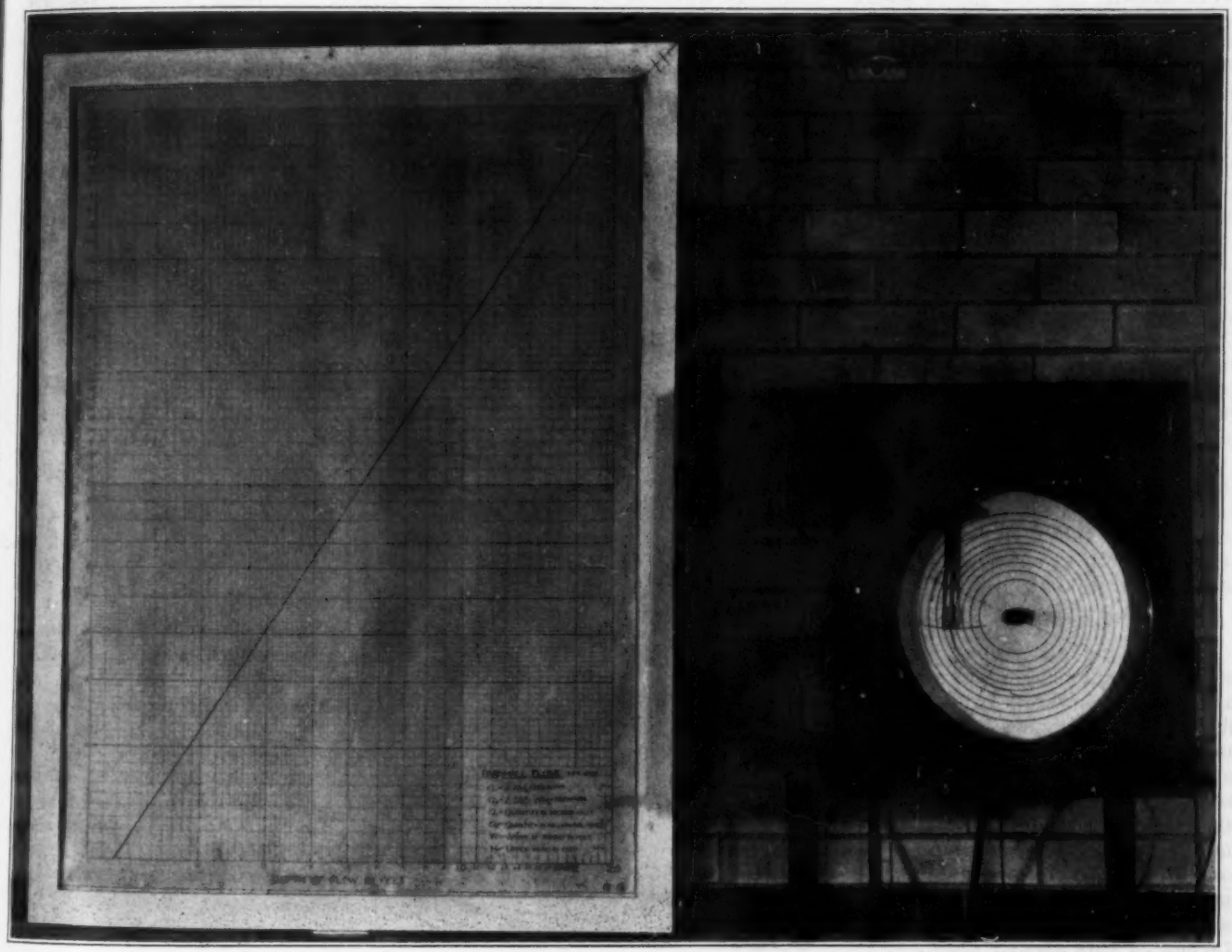


Fig. 1—The Slough Flow Recorder and Graph for Determining Flows from Recorded Depths.
Graph Converts Recorded Flow (abscissa) to Flow in M.G.D. (ordinate)

ers, the plant receives considerable amounts of storm water along with the sanitary sewage.

Dry weather flows range between 0.8 to 1.0 M. G. D. with storm flows at the rate of 5.0 to 6.0 M. G. D. (Spring run offs and heavy precipitation and flood conditions.)

The plant has a Parshall Flume 12 inches wide equipped with a Simplex flow indicating and recording unit, float operated from a stilling well. Its range is 0.0 to 4.2 M. G. D., above which the flow goes off scale and no record is made of the higher volumes.

It was believed, by the author, that there was some economical means of measuring and recording these high volumes and that the information obtained would be useful in plant operation.

To be practical this new means of flow estimation had to be simple and easy to construct, rugged and easily calibrated. After careful thought and study of the problem, a recorder was designed.

The design of the new instrument was based upon a logarithmic curve drawn on graph paper where cross sections were made using a slide rule having a scale with a 20 inch base. This gave a curve that could be read accurately to three figures and served as a standard for calibration. The points on the graph were calculated from the formula found in WATER WORKS & SEWERAGE for July 1936.

$$Q_2 = 2.575\ W\ H_a\ 1.522\ W\ 0.026$$

During the past Fall and Winter the author took instructions, evenings, in a Machine Shop Practice Course, the better to be able to make repairs and keep his plant in good condition during the present emergency of skilled labor and material shortages.

Permission was obtained from the machine shop instructors to construct the new recorder as a project and the instructors joined in with their experience and gave much helpful aid.

The Slough Flo-Recorder

Briefly, the recording unit consists of a flanged pulley turned by a counter weighted cable from a float in a stilling well. The pulley is fixed on a shaft recessed on either end to take a 60° point for a bearing. Also on this same shaft is a pinion gear. The pinion gear meshes with a spur gear on a second shaft, the ratio being 1:3. The pen arm, with its tangent adjusting screw for close adjustments, is attached to this second shaft.

The pen draws its graph on a chart that can be easily calibrated to different ranges as is desired, it being possible to easily adjust this recorder to any width Parshall Flume or to any portion of flow through a Parshall Flume of any dimensions.

The self starting electric clock is set to cut on by a mercroid switch just prior to the upper limits of the regular recorder which is blocked off just under its upper limits. The pen of the new recorder then records the higher flows and as the lower volumes return the process automatically reverses itself leaving an accurate record of the high volume flows.

The recorder, shown with its conversion chart in Fig. 1, may also be quickly converted to check the regular flow recorder at ordinary flows.

Calibration

With the float, cable and meter in place ready to calibrate, some value of the H_a (variable) is built up in the stilling well. For example to 1 M. G. D. as read on the graph, then with the pen resting on the chart the knurled nut is loosed and the chart rotated producing a circle to be labeled 1.0 M. G. D. The H_a value is raised say to 1.5 M. G. D. and the process repeated, etc. The intervening spaces can be located in the same manner or with a compass.

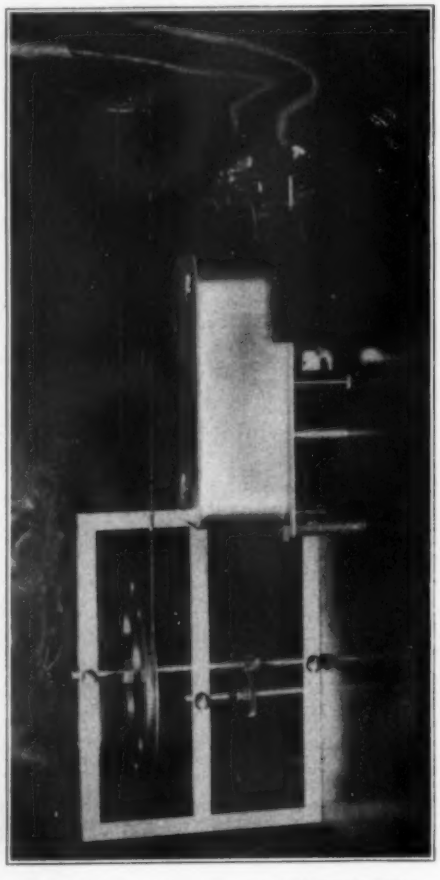


Fig. 2—Interior View of Slough Flo-Recording Unit.

If the chart is divided into 24 segments thus cutting the graph into as many portions these can be averaged and the volume obtained for a 24 hour period. If the back of a printed standard chart is used it can be held up to a light and the one hour sections marked off very easily.

To make other charts impose the master chart on a blank and with a sharp needle mark the divisions which are then easily drawn in with a compass.

Several ranges of charts have been made to date as follows: 1.0–2.5, 2.0 to 4.0 and 3.7 to 6.0 M. G. D., all of which fit a standard 11⅜" chart.

Materials

The recorder shown in Fig. 2 was made from scrap steel and iron on the various machines found in a well equipped machine shop. There is no reason, however, why a recorder cannot be built using plywood for the case, hard wood dowels or hand filed spikes for shafts and pulleys made on a wood turning lathe. The pen arm is made from an old hacksaw blade with the hod type pen from a standard indicating unit such as a recording thermometer. The clock was taken from a standard time switch having a 24 hour spindle.

The 4" diameter float, obtained from a plumbing supply store, is a standard toilet flush tank part. The cable can be a good quality linen line, fish line, tinned picture frame wire or just plain ordinary chalk line as was used.

A careful estimate of materials cost, if made from plywood and wooden pulleys, follows:

1 clock	$14.00
Plywood—10 square feet	1.50
Float and cable	.75
Pen	.50
Stove bolts, screws, hinges and window	.50
3 pulleys (wood)	2.00
	$19.25
If gears are used add	$ 1.00

Now add to the above the fun of making and with the aid of Yankee ingenuity a new instrument and valuable tool is brought into being.

We in Wellsville are proud of our sewage treatment plant and its service to our community and it will give the author pleasure if this article adds some small contribution to the profession of sewage plant operation.

REFERENCES:

1 Wittwer, N. C., Water Works and Sewerage, July, 1936.
2 Barker, Stanley, Water Works and Sewerage, April, 1939.

KANSAS CITY WATER IMPROVEMENTS MEET WARTIME CONDITIONS

Director King

By KENNETH K. KING
Director
WATER DEPARTMENT
KANSAS CITY, MISSOURI

This paper was presented in the Superintendent's Prize Contest Session of the AWWA Wartime Conference in Cleveland, Ohio, June 17, 1943. It was voted a tie position for First Award and is here reproduced by permission of the Association.—Ed.

SINCE the Spring of 1940, many changes have been effected in the Kansas City Water Department, some in the form of additional or improved services to consumers, and others to effect economies and make possible improvements not otherwise obtainable without increase in water rates. All of the economies and improvements have aided greatly in meeting wartime emergency conditions. The only recent improvement adding materially to production costs has been the softening of the water, but the costs of overall operation are still far below those of years previous to 1940.

The K. C. System in Brief

The system serves a population now estimated at 525,000 persons in an area of 302 square miles served by about 870 miles of mains. Water pumped averages about 57 million gallons per day, with the maximum to date 96 million.

The supply is taken from the Missouri River, the river intake and treatment works being about four miles north of the city. A complete description of the purification and softening processes by Mr. M. F. Hatcher, Chief Engineer of the Department, has been published in WATER WORKS AND SEWERAGE for May, 1942.

Before the facilities for softening were completed in 1942, the plant had a nominal capacity, limited by the filters, of about 100 million gallons daily. Since softening, the limitation is principally in the discharge header for the secondary low head electric-driven pumps, which have a rated capacity of 125 million gallons daily. Comparatively minor modifications would increase the capacity of the works to 150 m.g.d.

The improvements in the treatment works in 1942, costing $900,000, obtained from revenues after reduction in operating costs, were principally the new chemical building and storage facilities necessary for the greatly increased quantities of chemicals used, the changing of mixing basins, and the addition of mechanical equipment to existing settling basins. The expenditure for softening facilities would be justified by increased plant capacity, even if the benefits of softening to the consumers were not obtained.

One of the problems inherited by the new administration in the Spring of 1940 was the obvious necessity of refunding an $11,000,000 bond issue sold in 1922, on which nearly $9,000,000 has been paid in interest, but for which no sinking fund was available to retire the debt when due July 1, 1942. The bonds were sold chiefly to obtain funds to build the treatment works at North Kansas City, the East Bottoms High Lift Station and certain pressure tunnels and large mains. A sinking fund had originally been established, reached $2,306,843.41 in 1930, but these funds were diverted to other uses to such an extent that on March 31, 1940, only $43,603.91 remained. It no doubt was fortunate that about two years remained before this debt had to be met. After more than a year of improved operation of the Department, the bonds were refunded with serial bonds, partly general obligation and partly revenue bonds, at low interest rates, so that the entire $11,000,000 will be paid in installments to be completed in 1961.

The plant investment of the Department is $28,146,754.50, and the bonded debt is $13,652,000, requiring the heavy annual principal and interest payment of about $886,000 until the $11,000,000 issue is retired.

Recent History of Operating Expenses

The following tabulation will illustrate the extent of savings in operat-

Kansas City's Softening Plant
As Valuable in Wartime for Its Greater Capacity as for the Consumers' Benefits from a Softened Supply.

ing expenses that are being made. For comparative purposes, the term "Operating Expense" includes all expenditures exclusive of those for debt service and capital outlays. The amounts available for debt service and capital outlays are included under "Net After Operation." Figures shown for periods prior to 1940 are based on the Department's annual reports, although later auditing made minor changes for the year 1939-40.

are more than 50 per cent above those of 1917-18, and have been increased on the average 22.7 per cent since April 30, 1940.

The average ratio of operating expense to revenue for the past three years is 45.3 per cent. The average for the 20 years preceding is 67.2 per cent.

How Operating Savings Were Realized

The saving in operating expense has been accomplished largely by reduction in number and improvement in efficiency of personnel employed, with less but material economies effected through better purchasing practices. The Department now employs about 375 persons, exclusive of armed guards performing no service except the important but abnormal one of guarding the properties. There are fewer employees than at any time in the past 25 years, the peak having been in 1938-39 when there were approximately 900. On April 30, 1940, there were 630 employees, this number having remained practically constant through the preceding year. By the reduction in number of employees during the past three years, the Department has released 255 persons who are thus made available for the armed forces or for war production.

OPERATING EXPENSES

	Revenue	Operating Expense	Net After Operation
Average of 5 years to April 30, 1939	2,295,189	1,523,591	771,598
Year ending April 30, 1939	2,248,089	1,616,65.*	631,437
Year ending April 30, 1940	2,350,979	1,358,155	992,824
Year ending April 30, 1941	2,351,102	1,042,832	1,308,270
Year ending April 30, 1942	2,293,483	1,015,019	1,278,464
Year ending April 30, 1943	2,355,402	1,115,438	1,239,964

*Maximum operating expense for any year.

The expense shown for 1942-43 includes about $95,413 for additional expense of water softening after August 1, 1942, and $70,196 for armed guards necessitated by the war. Without these two items, the operating expense for the past year would be only about $949,829. Nevertheless, operating expenses in the past three years have been lower than in any year since that ending April 30, 1918, when the revenue was $1,306,233 and the expense $892,481. Salaries and wage rates paid now

Purchasing practices now assure honest competitive bidding with equal opportunities for all suppliers. Requirements are well advertised, and awards made entirely on the basis of the best prices for the quality specified.

The contract for electric power was re-negotiated, saving $30,000 per year. Demands at the electric pumping stations have been reduced by close control of load peaks, with consequent savings in addition to the $30,000, this also assisting the power plant in meeting increased wartime demands.

The use of motor vehicles has been greatly reduced. Careful cost records are kept for each item of motor equipment, based on daily reports of mileage, on gasoline consumption, and maintenance and repair costs. Each operator is held responsible for performing his duties with the least possible milage, routing being carefully studied and planned in advance where possible. Considerably less

Kansas City's Meter Repair Shop

than one-half as much gasoline is now used than was used in the year ending April 30, 1939. The saving in tires is roughly proportional.

Metering Economies

Periodic checking of water meters was introduced, and charging for repairs of smaller sizes of city-owned meters discontinued, with householders permitted to transfer ownership to the city, so that meters could be exchanged and one trip made instead of the two required when the same meter (as the customer's property) had to be returned. This periodic checking, cleaning and repair makes possible the reconditioning and use of meters and parts that might otherwise have to be replaced new with consequent consumption of greater quantities of critical materials. This program, together with economy efforts of street and boulevard cleaning divisions of other departments using water for flushing, has reduced the unaccounted for water and "free" water from about 33 per cent to about 26.5 per cent.

Changes in methods of water purification have reduced the amount of alum used by 2000 tons per year, giving an estimated saving in bauxite of 630 tons. Greater amounts of iron sulphate, soda ash and lime are used; but the saving in the critical bauxite is enough to produce approximately 150 tons of aluminum, now so essential in the war effort.

Modern Accounting and Collection System Installed

In 1941, with the aid of outside consultants, new systems were installed in the Administration and Collection Divisions, for cost accounting, stores inventory, payroll distribution, transportation cost distribution, consumers' accounts, and all the routine office work of these divisions.

Cost accounts are kept in accordance with the A.W.W.A. "Manual of Water Works Accounting," and a most modern machine bookkeeping system has been installed. Stores inventory records are kept using the same machines and visible index posting trays. The payroll labor distribution, and the transportation cost distribution for about 116 pieces of transportation and other equipment, requires the time of two clerks and part time of one calculating machine operator. Some unusual and convenient forms, such as are illustrated in Special Bulletin H (April, 1943), of the Municipal Finance Officers Association, are being used.

In the Collection Division, the system was almost entirely changed.

Two of the New Bookkeeping Machines and Visible Index Posting Trays for Inventory Control

New ledgers were made, using a double entry system instead of the former single entry, so that partial payments may be accepted and necessary charges carried to the next billing. The billing machines also had to be changed to permit adding to subsequent bills. Previously, it was exceedingly annoying to all parties concerned that there was no means of recording acceptance of other than the full payment of water bills, it being necessary to return checks lacking only the few cents of a penalty charge for late payment. In opening new accounts, closing accounts, and furnishing duplicate bills, clerks maintain telephone contact with the record room, where are located the ledgers and a "Flexoline" file, cross-referencing every account both by name and address. (see Cover Picture). Any of the services described are accomplished in not more than 4 minutes, usually less. Deposits may be transferred from one address to another on written, telephoned or personal instructions; and current accounts receivable also are transferred, making it unnecessary to render a final bill, this constituting appreciated improvements not formerly permitted. The former practice that required new consumers to pay the overdue accounts of previous residents of premises, before they would be given water service, has been discontinued.

A complete re-routing of meter readers has very greatly reduced meter reading time required. Cycle billing was begun in the last few months of the previous administration, leveling off the load and permitting reduction in personnel required. Post card machine billing is used, all data on the cards being printed on machines in the office. The cards are first addressed and printed, using a machine purchased in 1941, and then completed on the billing machines. There are about 87,500 accounts, of which about 81,400 are billed bi-monthly, 3500 larger accounts are billed monthly, and 2600 flat rate accounts billed quarterly in advance. While the installation of the new systems has resulted in large cost reductions, they have meant a greater improvement in service also.

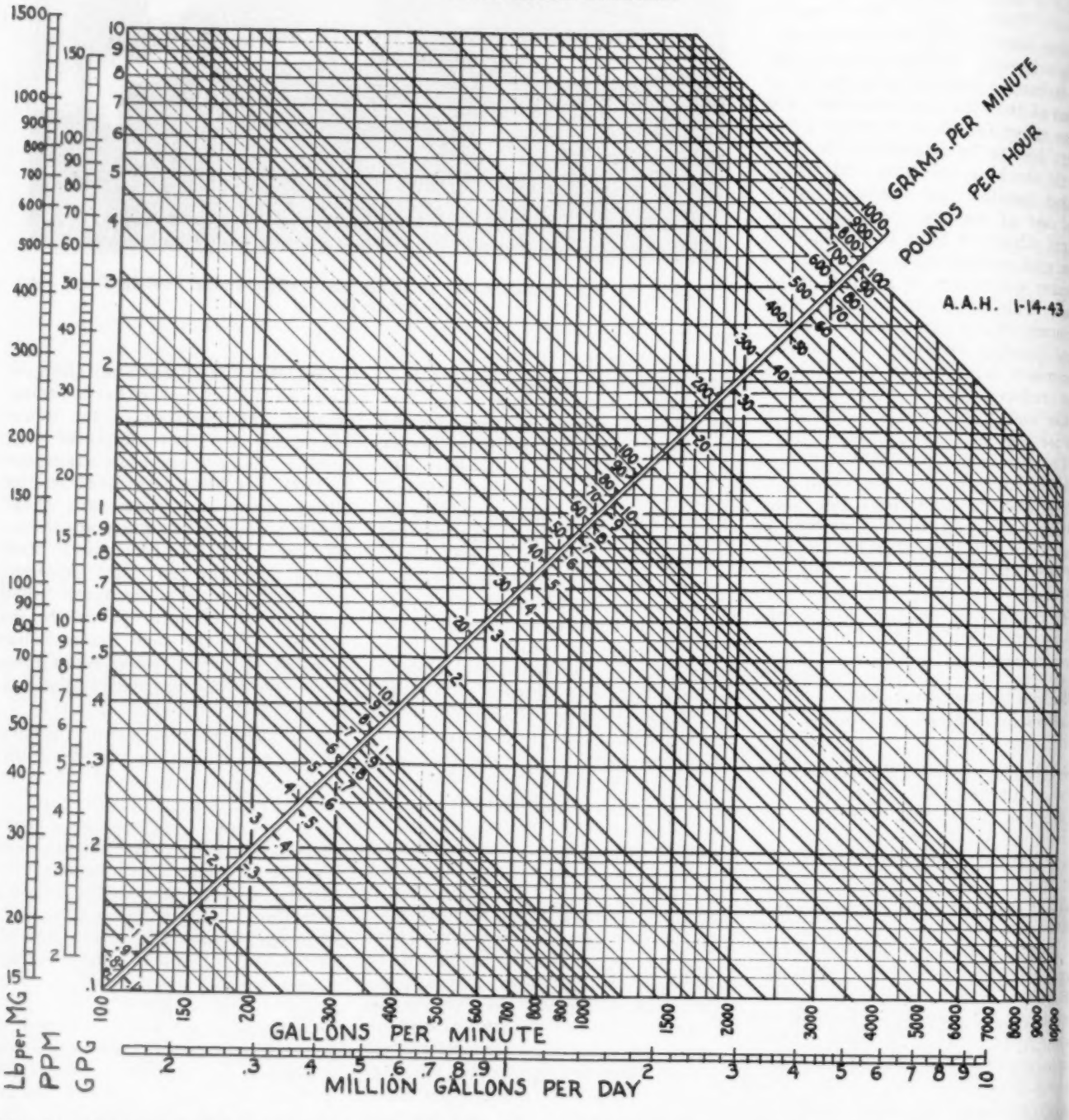
The principal operating division of the department is that of Engineering, employing about 275 persons. It is responsible for purification, pumping, distribution, engineering planning, maintenance, and construction activities. Some of the specific savings due to the efficient operation of this division have been enumerated, and the others are reflected in the reduced operating expenses of the department. Several projects for improvement of the system have had to be deferred on account of the war. Plans have been completed for a central garage and storage building, estimated before the war to cost $300,000.

Kansas City has a Mayor-Council-City Manager form of government. The improvements in the Water Department have been made possible by exceptionally able elected officials who have supported a merit system for employees and a business administration by the City Manager.. The efforts and loyalty of the Water Department employees of all ranks has contributed markedly.

CHECKING CHART FOR DRY CHEMICAL FEEDERS

A. A. HIRSCH*

State Department of Education
BATON ROUGE, LOUISIANA



The chart shown herewith offers a convenient means to check on the delivery of dry feed machines when the pumpage rate and the desired dosage is known. Rate of feed is expressed in grams per minute to enable weighing a timed discharge to check the feeder setting, and in pounds per hour to figure quickly the quantity needed in the hopper for each expected hour of operation. Chlorine dosage may be read knowing the change in platform scale readings per hour and the flow.

Parallel scales along each axis allow rapid conversion from one system of expression to another. On the vertical axis grains per gallon, parts per million and pounds per million gallons are quickly related by scanning directly across the scales. Gallons per minute and million gallons per day are similarly converted along the horizontal scale. In the plot grams per minute and pounds per hour are interchangeable across the diagonal scales. Pounds per hour is more logical from an operator's viewpoint than pounds per day. Many small plants operate only part of a day, or have a limited number of pumping steps, in which case pounds per day is merely a bookkeeping quantity.

A wide range in coverage is provided by the logarithmic divisions. High values not included on the chart may be read by using a tenth or hundredth of the quantity and applying the corresponding multiplier to the reading.

Example. How many grams per minute must be discharged from a dry feeder to give a 2 grain per gallon dosage while operating a 300 gallon per minute system?

Solution. Find the point where the 2 grain per gallon line and the 300 gallon per minute vertical intersect. This point lies between the 35 and 40 gram per minute diagonals at about 38 grams per minute. By projecting this value across the diagonal scales the hourly chemical consumption of 5.0 pounds is read.

When the answer falls in the area occupied by pounds per hour diagonals readings are converted to grams per minute by projecting in the same manner across the oblique scale.

When a metric scale is unavailable grams per minute may be obtained directly by catching the dry feeder discharge for 17 seconds and multiplying the weight in ounces by 10.

*Director, Secticnal School on Water Supply and Sewerage.

A.W.W.A. TECHNICAL SESSIONS AT CLEVELAND

Plant Management and Operation, and Finance and Accounting Divisions Also Open Session of the Steel Pipe Committee

A Report
By GEORGE E. SYMONS
Assoc. Editor

AT THE Cleveland meeting of A.W.W.A. in June the Plant Management and Operation Division held two meetings by itself and a joint meeting with the Finance and Accounting Division. In the first of these meetings the development of Cleveland's water supply and that of the Army camps were featured with job classifications and elevated tank repair and painting. In the second session the superintendent's prize contest on "How 'Our Town' Met the War Emergency" shared the program with a review of new materials and a report on plastic Saran pipe. The joint session on "Telling the Water Works Story to the Public" included three motion pictures owned by water utilities and a radio play.

The Finance and Accounting Division heard papers and discussions on social security legislation, commission controlled water plant operation, and comparisons of water rates.

The Steel Pipe Committee held an open session which included a report on current activities of the committee, the A.W.W.A. Manual on design and installation of steel pipe, field welding and mechanical joints.

Plant Management and Operation Papers

Cleveland's Water Supply

The speakers on the quarter century's water supply development in Cleveland were introduced by George Hamlin, Commissioner of Water. First paper on this panel discussion was presented by A. G. Levy, Engineer of Construction and Surveys. With a brief resume of the capacity of the plants, the costs of installation, and the extent of the service lines, Mr. Levy stated that the general plan for Cleveland's water supply, formulated in 1918, was still being followed in 1943—25 years later. The consumption anticipated for 1943, however, had been exceeded in 1942.

There are five major divisions in this plan, including rehabilitation of certain plants, construction of reservoirs and construction of new filter plants. Not all of the original plan has been carried out as there still remains work to be done on some of the reservoirs and the plants. The Cleveland water supply now furnishes water to 925,000 persons within the city and 360,000 consumers in the surrounding counties.

A Pair of Past Presidents
(And Valuable Ones)

Eugene F. Dugger, Gen'l Manager, Water Comm., Newport News, Va.

Louis R. Howson, Alvord, Burdick & Howson, Engr's. Chicago

(Both Received the Fuller Award)

L. A. Marshall, Supt. of Filtration, described the Baldwin plant of Cleveland's water supply. The intake for this plant is 4½ miles offshore in Lake Erie; the plant itself is four miles inland. Original treatment at this plant consisted of alum and chlorine, and later ammonia and post-chlorination with activated carbon. Last year break-point chlorination was introduced and now 0.12 p.p.m. of residual chlorine is carried. Better results and better quality of water have been observed.

The general improvement in the quality of Cleveland's water over the past quarter century is evidenced by the decline in typhoid fever death rates. In 1900 the death rate for typhoid fever was 110 per 100,000; in 1905 it was 14.9 per 100,000. At the present time it is practically nil.

In completing the panel discussion, S. C. Simmermacher, Chief of Power Plants, described 22 years of development of the pumping plants. In that time 21 new units have been installed, with capacities varying from 250,000 g.p.d. to 75 m.g.d. Seven pumps have been junked and seven more have been moved. Of four major items in the construction plan, two have been completed, including the increase in capacity from 130 m.g.d. to 2,000 m.g.d. The new Easterly and Westerly plants have not been completed. Temporary relief for war industries has been afforded by booster pumps.

Mr. Simmermacher stated that the two main problems at the present time are the shortage of help and the shortage of capacity. A severe dry spell would necessitate the curtailing of the supply. This possible condition might have been prevented if the original construction program had been carried to completion. In reply to a question, the speaker stated that the consumption of water in May, 1942, was 12 per cent over that of May, 1941, and the consumption in May, 1943, was 5 per cent over that in May, 1942.

Julian B. McFarland, Mgr. of Publicity, U. S. Pipe & Fdy. Co., Burlington, N. J.
and
E. Arthur Carr, Supt. of Water, Ridgewood, N. J.

"Jim" Barker, Pacific Coast Mgr., Neptune Meter Co., San Francisco
and
Chas. Bachmann, Neptune Meter Co., New York City.

The Kinney Bros. of W. & T., "Jim"—Canadian Manager, Toronto,
and
"Ed." K., District Mgr., Indianapolis.

J. L. Lindner, Supt. of Meters, Bayonne, N. J.,
and
Arthur P. Kuranz, Supt. of Water, Waukesha, Wis.

Baxter Wade, Supt. of Water and Sewerage, Jackson, Miss.,
and
N. T. ("Tom") Veatch, Black and Veatch, Engrs., Kansas City, Mo.

Directors

H. H. Hyman, Vice-Pres., Consumers' Water Co., Miami, Fla.
John S. Longwell, Genl. Mgr., East Bay Utilities Dist., Oakland, Calif.
W. W. DeBerard, City Engr., Chicago.
Thos. L. Amiss, Supt., Water Work and Sewerage, Shreveport, La.
Wallace W. Moorehouse, Supt., Water Works and Sewerage, Dayton, O.
N. T. Veatch, Jr., Cons. Engr., Black & Veatch, Engrs., Kansas City, Mo.

L. R. Howson, Cons. Engr. of Chicago, remarked on the benefits of long range planning, and mentioned that in Cleveland the general plan had been reviewed at ten-year intervals since 1920, with changes only in detail. In the decade of the "threadbare thirties" it was difficult to convince citizens that industry would "come back," and that increased water capacity would be required. Consequently there was a lack of construction then leading to the shortage of plant capacity now observed.

Army Training Camps Water Supply

L. H. Kessler, Principal Civil Engineer, Water and Sewage Unit, R & U Branch, Construction Division, War Department, presented a paper prepared with Maj. V. Bruce Sundstrom and Arthur O. Tomek on the subject of "Water Supply in Army Training Centers." In an exceedingly short time, army camps costing 11 billion dollars have been constructed. Sites of these camps have not been entirely dependent on water supply, but quite often are.

A thousand different waters have been encountered in 1,044 water supplies within camps and 340 purchased water supplies. Thirty-eight per cent of the water is purchased, 41 per cent comes from wells and 21 per cent comes from surface supplies. Mr. Kessler commented on the general factors of design, including the capacity factors and the per capita consumption. Wells, most of which are pumped, appear best suited for army camps. A few wells have air lifts and there is one Ranney water collector consisting of a large diameter dug well with radial well points driven horizontally.

Not only is it difficult to obtain good men to operate the plants, but it is also difficult to obtain the necessary equipment and material to construct them. This fact is indicated by the installation at one plant of five kinds of pipe and four types of joints in one mile of service. The Tate pipe lining method of applying cement linings to pipes in the ground has been found satisfactory.

A part of the job of the engineer is to minimize the leaks and study excess water usage. At one camp the elimination of continuously flushed urinals saved 26 gallons of water per capita per day. The value of that saving was $1,083 per month.

Chlorination is practiced at all posts. Chloramine treatment is used only in the larger plants. Scale and corrosion are accelerated by high temperatures maintained for sterilizing dishes. Hot water tanks have been "going out." The Army is now preparing for treatment to minimize this corrosion effect.

Programmers

La Verne, Trentlage, Supt. of Meters, Elgin, Ill.*
Kenneth K. King, Director of Water, Kansas City, Mo.*
Albert R. Davis, Supt. of Water & Sewerage, Austin, Texas.
*(*Prize Winners in the Supt's. Contest.)*

Following the presentation of this paper Mr. Wiggin of New York asked what control was had over the cement for lining pipes. Mr. Kessler replied that the Tate specification was used for all pipe, but in the case of water heaters a special formula was used. Mr. Enslow of New York asked whether the residual chlorine maintained (0.4 p.p.m.) as the minimum was chloramine or free chlorine residual. Mr. Kessler replied that it was intended to be free chlorine and that Mr. Moore's test to determine free chlorine in the presence of chloramines was being used in this connection. Mr. Brush of New York inquired whether the water attacked the cement linings in hot water tanks. Mr. Kessler replied in the negative, stating that the cement lining remained rather soft and could be easily scratched with a knife.

The Classification of Water Works Jobs

Albert R. Davis, Supt. of Water at Austin, Tex., read a paper on "A Study of Job Classifications and Titles in Municipal Water Works." "All managers and superintendents in water plants are also personnel managers," said Mr. Davis.

In this study, jobs of equal work were grouped together according to the duties involved in the position. Next the various titles applied to that job or position were listed from the sixty-four replies to the questionnaire. Mr. Davis believes that if the water works profession is to progress it must have an orderly plan of positions and salaries from the lowest employee to the department head. The selection of titles for these positions is important to that plan.

Of the sixty-four plants replying to the questionnaire, twenty have a merit system and twenty-three have some form of personnel system. There are, on the average, just about twenty titles for each class of posi-

(1) *Horace White, Supt. of Water, Williamsburg, Ohio*
(2) *Leonard M. Thompson, Supt. of Water, St. Paul, Minn.*
(3) *Wendell R. La Due, Director, Bureau of Water and Sewerage, Akron, O. (Chosen president of the newly-formed George W. Fuller Award Society of the A.W.W.A.)*
(4) *Alan D. Drake, Director of Water, Buffalo, N. Y.*
(5) *L. J. Hoffman, Office Mgr., Bureau of Water and Sewerage, Akron, O.*

Jerry Manahan
A. P. Smith Mfg. Co.
East Orange, N. J.
and
Hugh L. Baker, Mgr.
The Mueller Co.
Chattanooga, Tenn.

Ross L. Dobbin
Mgr. of Utilities
Peterboro, Canada
and
"Jim" Kinney
Canadian Manager
Wallace & Tiernan Co.

*Harvey F. Ludwig**
Engr., U.S.P.H.S.
Atlanta, Ga.
and
Chas. P. Hoover
Supt. of Purification
Columbus, Ohio

Jim Brown,
Nat'l Water Main Cl. Co., and
Marvin Turner,
Designing Engr.,
Austin, Tex.

John W. Burton,
Manager of Sales,
and
J. A. ("Dick") Thomas,
General Manager,
Roberts Filter Co.,
Darby, Pa.

(**Goodell prize winner for best paper of the year.*)

tion. The minimum number was nine and the maximum number was thirty-two, the latter being for superintendents or managers of water systems. Mr. Davis suggested that the word "engineer" should appear in the title for superintendents or managers.

Local interest has apparently been uppermost in the choice of titles, without consideration of benefits to the water department. Mr. Davis concluded with the statement that the "Dictionary of Titles" prepared by the Federal Government is woefully short on titles for municipal positions.

Elevated Tank Repair

Calling attention to the tank maintenance racket which has become prevalent in the past several years, Louis R. Howson, Cons. Engr. of Chicago, spoke on "A Recommended Form of Contract for Elevated Tank Painting." Howson said that in considering a contractor for a tank painting job one should look for symptoms of the "racket":

If the literature of the company contains scare headlines—look out!

If undue haste is exhibited by salesman for the company—beware!

If the salesman draws the contract—hesitate!

If the agreement calls for repair of rivets at so much per rivet—don't sign!

A committee of the A.W.W.A. has drawn tentative specifications regarding the painting of elevated tanks (see A.W.W.A. Journal, July, 1943). These specifications are divided into two parts—information, and outline of good painting practice. Tanks need to be painted only once in five or six years unless corrosion is severe. The inside of the tank is most important. The number of coats to be applied depends on the condition. Spots should be cleaned and touched up, followed by a primer and second coat. Paint may be red lead and oil, asphalt, coal tar enamel, or resins. It is advisable to consult the manufacturer of the tank for his advice before repair or painting. It is also advisable to have an inspection of the tank and a bid on the contract submitted.

Corrosion of the head of the rivet does not mean that the rivet must be replaced. Corrosion of the spider rods which are installed during construction doesn't mean that the tank will fall down when they rust out.

When leaks occur it is well to consult the manufacturer. Leaks may be expected at expansion joints, where they can be repaired easily. Leaks through the plate are more serious, and if in the bottom may indicate the need for replacement. Welded patches may be doubful economy.

Mr. Howson concluded with the comment that "there is more to being a tank maintenance man than just being a steeplejack, and a satisfactory rating in Dun and Bradstreet is not particularly essential to a contractor's ability and honesty."

Following a question regarding the use of black or aluminum paint, several persons told of experiences showing that black paint absorbed more heat than aluminum, and aluminum more than white. The temperature of water in tanks painted black will rise several degrees because of this absorbed heat.

Programmers

(*Manpower and Labor Relations*)

J. W. Irwin, Asst. to President, Monsanto Chem. Co., St. Louis, Mo.

P. B. Niles, Director of Personnel, Am. Water Wks. & Elec. Co., N. Y. City

Chas. J. Alfke, Exec. Vice-President, Hackensack Water Co., Hackensack, N. J.

Superintendent's Prize Contest

A series of five papers developed in competition on the subject of "How 'Our Town' Met the War Emergency" was presented by the authors who were unannounced until called to the platform. The order of the awards was announced after the papers were read. First place was shared by Timothy W. Good of Cambridge, Mass., and Kenneth King of Kansas City, Mo.

Mr. King reported on general improvements and economies in operation brought about by good management. Costs of operation have been reduced in spite of the introduction of water softening. Operating personnel has been reduced and efficiency increased. Costs are now down about 30 per cent while salaries and wages are up 22 per cent. Whereas these improvements have not been a direct result of the war emergency, they have been helpful in meeting war-time problems which have arisen.

The main problem at Cambridge was one of increased consumption and the steps taken to meet this demand by increasing facilities was told by Mr. Good.

H. B. Peterson of Marshalltown, Ia., said that elimination of new water main construction, salvaging valves, reducing personnel and repairing meters had failed to meet the problem of dwindling population and consequent dwindling of income to a point where it fails to meet operating costs.

W. R. Schnable of Allentown, Pa., told how a leak survey in that city had revealed a water loss of 3.75 m.g.d., much of which was through old valves and leaky mains. The survey cost $21,000 and repairs cost $29,000 but the savings will amount to more than $15,000 per year and the increase in revenue will be approximately $11,000 a year. This latter will come from corrected registration of water meters and payment for water formerly used without authorization.

La Verne Trentlage of Elgin, Ill., told of three practices by which the Elgin plant had reduced expenditures, conserved materials and eliminated the need for new equipment.

Elimination of the meter reader "pick-ups," where readings were missed, and the use of post cards for consumer reporting in these cases has saved manpower, gasoline and tires. Construction of a "rattle-barrel" to clean the bottoms of meters has eliminated the need for special brushes and reduced the time and cost of cleaning.

Grinding-in of measuring chambers and disks in old meters has proved satisfactory and profitable. In two years almost 1,300 potentially wornout chambers have been saved and returned to use. Accuracy of these reclaimed chambers at low flows is very good. The cost of repairs per unit has been reduced from 46 cents to 20 cents by improving the method of grinding-in. The general use of the method has saved the need for and cost of many new meter parts made of critical materials.

New Materials for Post War Use

According to W. Victor Weir, Supt. of St. Louis County Water Co., the day is coming when materials will be available, and no more deferment of plans will be necessary. There will be transition problems but it is well to make plans now and to design where possible. For planning now one should have some idea of the material that will be available after the war. Mr. Weir queried 70 manufacturers and suppliers. There were four classes of replies: "Don't know of any new developments"; "Believe long experiments are yet needed and no indications yet that materials will differ greatly"; "Don't expect the water works field to benefit especially from new materials"; and "Believe there will be *some* new materials." This latter group is small.

It is expected that magnesium and plastics will be available as will new products from government and war research, but whether these will have special uses in water works problems is not known at present.

Some applications that may be expected include the following: Use of Diesel auxiliary high speed engines for furnishing power for auxiliary peak load pumps; possible application of electronics for the measurement and control of operation, especially where speed of operation is essential (hydraulic and mechanical control is less complicated and will probably continue to be used in the majority of cases); more fluorescent lighting will undoubtedly be used; a portable electron microscope may possibly be available for checking the bacterial condition of the water supply; plastics for chemical use may compete but will not supplant well known materials, except possibly hard rubber and some bronze. It is expected that the standard design of cast-iron pipe will return.

Mr. Weir suggests that utility men should go ahead with planning because there is nothing startling to supplant the old. It is suggested that designers should keep abreast of new developments. Manufacturers should make known any new developments but should remember that the water works industry will *not* be stampeded into thinking that everything will be supplanted by new materials. Novel ideas for novelty's sake are out.

Saran Pipe

A. A. Kalinske presented the results of "Experimental Studies of Saran as a Service Line Material." These studies were carried on under the direction of the co-author, Dean F. M. Dawson of the University of Iowa. The Saran tubing was tested in sizes up to ¾-inch outside diameter. This vinyl plastic will burn, but is self-extinguishing; will resist most alkalies except ammonia; has a low water absorption; is brittle at freezing temperatures; has low thermal conductivity, high coefficient of expansion, and changes strength with temperature.

Retiring Division Chairmen

J. C. Keith, Mgr., Utilities Comm., Windsor, Ont. (Plant Mgmt.)

W. V. Weir, Supt., St. Louis Co. (Mo.) Water Co. (Finance & Acctg.)

Bursting pressure at 170 deg. was 350 lb. and at 240 deg. was 240 lb. With 85 lb. static pressure and a flow of 8½ g.p.m., a water hammer of 250 lb. was observed. At 16 g.p.m. the water hammer pressure was 440 lb. Sometimes the joints pulled out, sometimes not. Messrs. Dawson and Kalinske suggested that the flare be changed from the standard brass design in order to improve the joint, and sizes should be made the same as metal pipe. While the tubing or pipe is hydraulically smooth, pressures cannot be maintained as high as in metal pipe.

In answer to a question Dean Dawson said that rats would chew the plastic if no food were available but will not eat the material. The tubing appears to be satisfactory for cold water, but for hot water only experimental installations should be made. The material has too great coefficient of expansion to be satisfactory where water temperature changes are marked. Hot water causes the material to soften to the extent that the flared connection lets go gradually.

Finance and Accounting Division

Social Security Legislation

Pending and proposed social security legislation was presented to the Finance and Accounting Division by Dale Maffitt, Gen. Mgr. of the Des Moines (Iowa) Water Co. In the original federal social security plans there was no provision for water works plants of municipalities, and Mr. Maffitt suggested that present legislation should be studied to be assured that water works men will have protection.

Social security has developed in this country from a committee study in 1934, through the first act in 1935, and the revision in 1939 to increase coverage, to the present study to bring in governmental employees.

The Beveridge plan in Britain contains a flat rate subsistence benefit, and a flat rate compulsory contribution, unified administration, adequacy of benefit, comprehensiveness of coverage, and six classes of beneficiaries. In contrast, the American plan is based on contributions and benefits proportional to the salary of the individual. The British plan, however, is still a theory whereas the American plan is already in operation.

In addition to the Federal plan, there are several state plans in operation in this country and several cities with similar retirement plans. Illinois, New York, Ohio, have civil service plans, and other states have plans under consideration.

It was interesting to learn from Norman Howard of Toronto that in Canada, where no social security legislation exists, many Canadian citizens are covered by American social security.

Commission Controlled Water Dept. Operation

In the absence of Wm. Storrie of Toronto, Dr. A. E. Berry of the Ontario Dept. of Health, told of the Ontario practice where there are 122 utilities commissions and 145 water plants with municipal control. These commissions are created by votes of assent, with three to five men elected at regular elections.

Money for the capital expansions of commission controlled water works is obtained from the municipality and the income, above operation expense, of the water utility must be turned over to the municipality—but not earmarked. This handling of finances is one of the difficulties of the system and is often a source of friction between the local utility commission and the municipal authority. The success of the commission system, and men who are elected to serve, is indicated by the fact that many commissions have members who have been re-elected over periods of from 25 to 44 years.

The American practice was explained by L. A. Smith, Supt. of Water Works at Madison, Wis., where the commission form has existed since 1907. Members are elected by the common council but quite generally serve long terms.

Churches, schools and similar institutions pay metered rates. Unpaid water bills are a lien on property. In Madison 99.9 per cent of all bills are paid. Most managers believe that the water commission form is best for municipally owned water utilities. The changes in superintendents under the commissions is infrequent. In Wisconsin there have been six changes in ten years and these only because the predecessors died or retired.

The commission form of water utility in Wisconsin has suffered a loss of 4 per cent of personnel because of the war, but water requirements have increased and may double before the end of the year. Other effects of the war have been noted in the return of over-age men to work or persons otherwise retired, and the use of women in water plants. Post card meter readings have been used with about 93 per cent correct readings.

Questions asked of Mr. Smith included this one: Can money saved because of lack of materials at the present be retained or earmarked for future use? The answer was yes. Mr. Smith also stated that fire protection rates are a part of the rate structure, based on an analysis of the situation by the very efficient Public Service Commission of Wisconsin.

N. L. Nussbaumer, Comm. of Works, Buffalo, N. Y., and Hugh S. Dewey, Mgr., West. N. Y. Water Co., Buffalo, N. Y.

W. B. Harman Asst. Gen. Mgr., Water Dept., Newport News, Va., and W. W. Winfree, Glamorgan Fdy., Lynchburg, Va.

Fred C. Brush, Mgr., Bound Brook (N. J.) Water Co. Jack Faulks, Dist. Mgr., Neptune Meter Co. Hal. Hutton, Asst. G.M., Wallace & Tiernan Co., Newark, N. J.

E. S. Gillette, V.-P., Gillette Pub. Co., Chicago, and "Doc" Symons, Assoc. Editor, Water Wks. & Sw'ge, New York

Paul Weir, Asst. Gen. Mgr., Water Dept., Atlanta, Ga., and Lee B. McMahon, Cleveland Mgr., Gillette Pub. Co.

Comparison of Water Rates

In a discussion led by W. Victor Weir of St. Louis and M. F. Hoffman of Cincinnati, the question, "How Can a Fair Comparison of Water Rates Be Made?" received some very definite answers most of which were "it can't." And, according to Mr. Weir, "all comparisons of water rates are unfair if any conclusions are reached." Differences in operation cannot be evaluated and therefore there should be no comparisons. Questionnaires are not satisfactory and comparison of annual reports does not give a complete answer because rate comparisons involve many factors and devious procedures. It is possible to establish the money needed for operation but rates are another matter. To make any comparison one must know that the rate is correct and equitable. This was the gist of the remarks of Mr. Weir, who concluded that "if one assumed that the rates were correct a comparison could be made, but such a comparison is still no good."

Hosts to Be—Milwaukee 1944
(Amongst the Manufacturers)

H. P. Binder, Manager, Pump Division, Allis-Chalmers Mfg. Co.

Jo E. Johnson, Manager of Sales, Badger Meter Co.

Bob Steindorf, Sanitary Division, Chain Belt Co.

M. F. Hoffman, Commercial Supt. of the Cincinnati Water Co., quoted a court decision to say that comparisons could not be made. Mr. Hoffman did propose that there were several questions that might be asked as a basis for making comparisons. These included the following:

1. Private or municipal supply?
2. Source of supply?
3. Purification costs per m.g.?
4. Who pays for capital expenditure?
5. Who pays for service installations?
6. Population of area served?
7. Who pays for meter?
8. Who pays for fire hydrants?
9. Rate schedule?
10. Is revenue restricted to water department use?
11. Is revenue collected and disbursed by water department?
12. Cost of operation, exclusive of amortization?
13. Annual charge of depreciation?
14. Book value of plant?

This proposed questionnaire contained many other questions designed to give a sound basis for comparing costs of operation of different plants.

A man from Seattle said, "It can't be done," and Mr. McCord of Memphis said, "No two plants are alike as to problem or method of operation. It is impossible because there are at least twelve variables to be taken into account." Regardless of what rates are in other communities, a water utility should determine how much is taken in and how much is spent and adjust rates according to the relation between those two items.

Although most of the persons

present at the session believed that comparisons were impossible, it was agreed that nevertheless a utility was often called upon to make a comparison. Mr. Hoffman's questions are an attempt to standardize a means of obtaining information that can be reduced to a common denominator. [To this writer it appears that the proposed system of questions might serve as a basis for preparing a weighted answer similar to the "market basket system" of determining the relative cost of living.]

It was decided that a resolution would be passed, calling on the permanent committee on uniform accounting practice to prepare a set of questions and incorporate them in a form that would serve as an annual report. From a study of many such annual reports, possibly the question of comparing rates may be answered in the next several years.

Steel Pipe Committee

Reporting on "The Current Activities of the Steel Pipe Committee," W. W. Hurlbut, Asst. Gen. Mgr., Bureau of Water, Los Angeles, said that, in general, committee standards have been followed. Last year a decision was made to publish these standards for steel pipe, and the work has been outlined in four chapters. These are: (1) Design factors; (2) specifications; (3) pipe coatings and protection, and (4) installation.

Design Factors

"Outline of design Factors" was presented by Russell E. Barnard, Advisory Engr., American Rolling Mill Co. It is planned to obtain a cross section of all references on the subject. Included in the list of design factors which are being compiled are standard specifications for steel pipe and coatings (but not flow capacity), specifications for spun enamel lining, Scobey's values on age, and corrosive effects.

W.P.B. limitations set up size and wall thickness to eliminate odd sizes of pipes. It is expected that future specifications between ⅛in. and 48 in. will fall within these limitations, namely: All present standard sizes under 12 inches; changes by 2 inches from 12 to 24 inches; changes by 4 inches from 24 to 48 inches; changes in wall thickness will be by 1/32 of an inch. These specifications will eliminate two-thirds of all the present sizes.

Suggestions in the report will include strength and hoop stress, and effects of water hammer. In arriving at specifications for determining thickness these several factors have been considered: External loading, trench loading, corrosion effect both inside and outside. Corrosion doesn't affect strength very much, but, whether it is chemical or bacterial, it does affect flow characteristics.

Other items to be included in this chapter on design factors are span data, resistance to outside corrosion, welding practice, types of joints, fittings, air pockets and codes.

The "Outline of Installation Procedure" was presented by Mr. Hurlbut, who covered the specifications for such items as transportation and handling of pipe, use of slings to prevent rupture of coatings, cover in trenches, clearance of trench, and preparation of trench bottoms.

Mr. Hurlbut said that 27 inches was the minimum diameter that could be successfully field-welded. Covered in the specification are: The problem of expansion and contraction, joints to be used, methods of anchoring and blocking at special points or on steep slopes, air and vacuum relief, selecting backfill, and leakage checks.

Field Welding

G. H. Garrett, Gen. Mgr. of Thompson Pipe & Steel Co., presented a paper co-authored with H. Arthur Price, on "Field Welding of Steel Water Pipe," in which it was stated that the specifications are to be set jointly by the A.W.W.A. and the American Welding Society. These specifications will include scope, quality of welding procedure, operators, filler metal, welds, repair, and other items of importance.

In the section on scope, the specifications will include the type of welds, whether gas, electric, or Linde Air system. Methods for testing welding operator competency will be discussed. Filler metal is important to the success of the joint and Mr. Garrett recommended the E-60-10 specification rods. Other items to be included in the specification will be type of equipment, generators, joints (slip, butt, or fillett), preparation of face metal, welding technique, and inspection.

Mechanical Joints

"Mechanical Joints for Water Lines" was the title of a paper read by Elson T. Killam, Cons. Engr. of N. Y. City. Mr. Killam discussed cost factors, problems of lining and coatings, sleeve type couplings and gasket design. Gaskets used with these mechanical joints are made of a special rubber and have a life of 40-50 years, or as long as the life of the pipe. Flexibility with this type of joint is good because of the rubber gasket. Lowering of the pipe into a trench depends on the flexibility as does the amount of curve that can be put into a line. Water tightness is good under all pressures. Following the paper, Mr. Killam showed several slides indicating applications and installation of these mechanical joints.

Joint Session

(P. M. & O. and F. & A. Divisions)

Telling the Water Works Story by Motion Picture

At a joint session, the Divisions of Plant Management and Operation and Finance and Accounting watched the "Telling of the Water Works Story to the Public" by the use of the motion picture. Pictures were shown from Syracuse, N. Y., Indianapolis, Ind., and Hackensack, N. J.

With Elon P. Stewart, Water Division Engineer, Syracuse, acting as narrator, the story of the Syracuse water supply was told in colored pictures taken by members of the department. This motion picture showed the water supply, transportation system, method of repairing leaks, plant operation, and laboratory technique used in the control of a safe water supply. The running commentary carried the story to the ears as well. The production cost was approximately $250.

Somewhat more ambitious, both in length and commentary, was the film of the Indianapolis Water Co. This film had resulted from a simple beginning ten years ago, with three intervening films. Since its completion in color it has been shown 270 times to an aggregate audience of 30,000 persons. Total audience viewing the four films has been 85,000 in 805 showings. Both H. S. Morse, Gen. Mgr. of the Indianapolis Water Co., and John E. Klienhenz, Publicity Mgr. and narrator, are of the opinion that the use of a narrator is more personal and that the commentary can thus be easily varied to suit the audience. This film cost $1,250 for its production.

C. J. Alfke and P. A. Pallo presented the motion picture made for the Hackensack Water Co. This picture had been contracted for with a regular studio in 1940 and in the 17 months since it had been available it has been shown 33 times to an average audience of 100 persons each time. Complete with special musical effects, color, fade-ins, fade-outs, a professional narrator on the sound track and animated maps this film cost $11,700. In spite of all the professional touches the film dragged, particularly in the long and beautiful introduction showing the

rainfall on many lovely flowers and woodland ponds. This introduction did not add to the story that one wishes to bring to the water consumer. The fixed script, with all its professional smoothness and presentation, lacked the personal touch present in the other presentations.

Radio—"The Deluge"

The radio as a public relations medium was presented to the audience by means of a radio script read and acted by several well-known water works personalities. The radio play was written by A. F. Dappert, Sr. San. Engr. of the N. Y. Dept. of Health, and was directed by E. A. Sigworth, Ind. Chem. Sales Co., acting as master of ceremonies.

"The Deluge," as the playlet was called, contained the problems of one small town whose sole water plant operator was due to be drafted. A flood following a "deluge" washed out the elevated storage tank and flooded out the pumping plant. "Smalltown" was saved from disaster by some good common sense of the town apothecary plus the important help of water auxiliaries furnished by nearby cities through the mutual aid plan.

A clever means of presenting the importance of mutual aid and its effectiveness in operation, the play was vaguely reminiscent to this reporter of "the deluge" which swept the southern tier counties of western N. Y. last year, when Olean and other villages received mutual aid in the very serious problem of obtaining water following a severely damaging flood.

Not without its humorous aspects in the applause and laughter signs held by Harry Krum of Allentown, Pa., the presentation gave one the feeling that radio is a means of presenting the water works story to the public.

Manpower and Labor Relations

"Manpower and Selective Service Problems", by Philip B. Niles, Personnel Director, Am. Water Works and Electric Co., New York, N. Y.

Mr. Niles responsible for personnel relations in the country's largest chain of water utility companies, emphasized the fact that the manpower situation in the water supply field is becoming more critical day by day. The present summer and approaching fall will most likely find the situation at its worst, with losses of men to the armed forces becoming heavier and more difficult to avoid.

Mr. Niles, reminding his audience that water supply was considered one of the most important and essential industries in the war effort, cautioned that it was expected of the industry that its operating and maintenance efficiency be kept up to a safe level. In this regard it was well to keep in mind that applying for employee deferment in the draft should be considered a duty of the management and by the same token the employee's reticence about being deferred should not influence the management in fulfilling its duty in circumventing manpower depletion. His experience had shown the Selective Service Act to have worked very effectively and fairly, largely because of its control at the local level. Never the less deferments were to become more difficult, and whenever possible, men in the class to be called in the next taking should have a replacement in training. Experience had shown that women are making good as "water works men", and should be used to the greatest extent permissible.

Another situation of consequence was the restlessness amongst water works employees who have been looking at war industry, and its present better pay, until it is becoming increasingly harder to hold a number of these men. He advised, however, against issuing certificates of availability to such employees. If the employee feels that he should be certified for employment elsewhere at higher pay, he should be referred to the U. S. Employment Service for a review of his case.

Mr. Niles stated that War Manpower Control is applicable to the water supply industry and this may well alter the picture in the future. In the meantime it is essential to watch developments and hold out every key employee possible by applying well in advance for deferments —at least for the time required for replacement training.

"Labor Relations in Municipally Owned Plants", by James W. Irwin, Assistant to the President, Monsanto Chemical Co., St. Louis, Mo.

Mr. Irwin, who serves as Chief Labor Officer for the progressive Monsanto organization, has during his successful career rarely appeared on public platforms and more rarely in print. A.W.W.A. was therefore very fortunate to secure him as a program participant. His advice to municipal management was that of a seasoned labor relations executive who might have been brought in as a consultant planning ahead for what may be expected by municipal employees and of such employees and employers of those who work in municipally owned and operated plants as well as plants of private utilities. His paper is one to be studied (*not merely read*) by managers when it appears in print later. We here cannot more than attempt to emphasize some of the high spots of the talk.

Mr. Irwin, appreciative of the political angle to labor-management relationships, nevertheless stressed the fact that the time is at hand when municipal managers should survey operations in respect to what may be called a reasonable expectancy on the part of publicly paid employees in regards pay rates, working conditions, continuity of employment, old age security through pension systems, dismissal pay, safety, and the like.

In citing some successful methods in industry Mr. Irwin pointed to the value of developing an "Employee Handbook" which serves as a primer for the newer employees and a constant reminder to older employees of the general policies of the manage-

W. R. Schnabel, Supt. Water, Allentown, Pa. | *Lee McMahon, Water Works & Sewerage, Cleveland* | *H. R. Power, Flexible Pipe Cl. Co., Los Angeles* | *Jos. Murray, Water Comm., Newton, Mass.* | *Jerry Zufelt, Supt. Water, Sheboygan, Wis.* | *J. D. Senevey, Collections Comm'r, Kansas City* | *Chas. Bourgin, Supt. Water, Montclair, N. J.*

ment and expectations from employees as well as the supervisory personnel. Such handbooks should prove particularly helpful in municipally operated plants, serving as a code for effective public relations as well as service, employee rights and behavior.

Perhaps of equal importance was a definite and continuing training program for the supervisory force. In addition to operating and public relations training the program should incorporate labor relations training for every foreman and supervisor. With such training emphasized both public relations and labor relations problems diminish rapidly.

As to unionization of public employees Mr. Irwin was of the opinion that in public plant operation there was a need for some form and degree of unionization of employees for their protection as a group. He advocated the secret ballot for the municipal employee as much as for the employee in private industry. He felt that the management should discuss policy with the employee group as an educational matter as well as a labor relations matter. Pay to the municipal employee should be on a plane with that for equivalent work or responsibilities in private enterprise in the same area. The same degree of performance and efficiency should be demanded of public as of industrial employees.

As to the right to strike, Mr. Irwin was emphatic in denying that any organized employee in a publicly owned plant serving a community with any product as essential as water, for domestic use and health and fire protection, had any right to strike if such cessation of work meant cessation in the supply of water. In other words, short of the organized strike in public water supply service, Mr. Irwin, as a man of long experience and wide vision in labor relations, felt that municipal employees should be accorded the right to organize and have a voice in matters pertaining to employment conditions, compensation and security.

Panel Discussion on Labor Relations

In the panel discussion following Mr. Irwin's talk the following were the highlights:

Chas. J. Alfke, Exec. Vice President, Hackensack Water Co., Weehawken, N. J., was of the opinion that water works managers might not like the shock of facing public employee organizing activities for the first time, but managements of water utilities would henceforth be compelled to give more attention and thought to employee relations than heretofore. Job classification and wage standardization was one of the urgent immediate needs in facing future developments in labor relations. Pensions, workmen's compensation, group insurance, medical attention, etc., were other pertinent considerations.

Mr. Alfke stated that the Hackensack Water Co. had never had a Personnel Department until an organizational movement was started by employees a few years ago. Feeling that such a department was needed, there is now a Personnel Director with three assistants who maintain a complete history of every employee, and are acquainted with every job in the organization. He advised every water works manager to look upon employee organizations in an impartial manner and try to retain the good and discard the bad. In the end the result may well prove overall a desirable development.

Walter S. Byrne, Gen'l Mgr., Metropolitan Utilities District, Omaha, Neb., was of the belief that public officials would henceforth be compelled to consider the labor unions in operating public services. Particularly in the post-war period will this relationship of the public official to the public and the employee prove important.

Carl A. Eberling, Supt. of Water, Cincinnati, Ohio, in a written statement, presented by W. J. Chenal of his staff, had the following to say. In the present difficulties in the Cincinnati Water Department the wage rates of war industries had been responsible. On Oct. 28, 1942, in the Cincinnati department 191 employees went out on strike. For two hours all pumps were shut down, but reservoir capacity prevented any disruption of supply. The following day the filter attendants walked out, but the supervisory force kept this plant in full operation, being fed and housed within the plant.

The strike which was over wages resulted in the city establishing a flat wartime bonus of $80 per year for all employees making less than $5000 and higher hourly rates for the lower paid group. The employees seem to be satisfied for the present at least.

Dana Van Dusen, Gen'l Counsel, Metropolitan Utilities Dist., Omaha, Neb., in relating Omaha experiences revealed the importance of legal guidance in dealings with employee unions. The Omaha case was submitted to the War Labor Board in Washington, which refused to act on the grounds that a governmental state agency was involved and that W.L.B. had no jurisdiction in such cases. Mr. Van Dusen stressed the obligation of the public official to the people. It was his opinion that such officials should refuse the easy way out—such as signing a labor union contract, with the proviso that such contract be voided if proven illegal. In Nebraska such a contract is illegal said Mr. Van Dusen.

Experience With Pre-stressed Concrete Pipe

"Experiences With a New Type of Prestressed Concrete Pressure Pipe", by W. W. De Berard, City Engineer and W. B. Weldon, Ass't Engr., Dept. of Public Works, Chicago.

This paper, presented by Mr. Weldon, related experiences in the installation of a two mile run of 36 inch concrete pressure pipe of novel design, in which the longitudinal reinforcing bars and the spiral wire winding are prestressed and thereafter jacketed with a concrete protective shell. Lantern slides revealed the design and fabrication of the pipes by the Lewistown Pipe Co. in its plant near Chicago. The same type of pipe had been used for a 30 inch main a year previous by Chicago.

This prestressed Lewistown pipe is made up in 12 ft. lengths with eighteen 5/16″ rods longitudinally spaced around the 36″ pipe one inch from the interior surface of the three inch concrete wall. These rods are prestressed to 30,000 lbs./sq. inch by screwing up bolts on the threaded ends extending through the steel form collars. The cement mortar is placed centrifugally, the pipe then steam cured before winding with No. 6 (3/16″) steel wire applied spirally at ½ inch spacing under a 2600 lbs. pull to give a compression stress of 1500 lbs./sq. inch in the two inch concrete wall. After applying the 200 lb. pressure test for leakage or cracking, the cement mortar jacket covering of one inch is applied to protect the steel wire. At the same time the steel sleeve to serve as a bell is bonded to the pipe.

When the stress nuts are removed from the reinforcing bars the concrete remains under a longitudinal compression of 90 lbs./sq. inch and a radial compression of 1500 lbs./sq. inch. When under 200 lbs. water head the 1500 lbs. is reduced to 300 lbs. external compression in the concrete wall.

The joint is made up with a feathered rubber gasket. The contract called for joint making by the

contractor and in the field tests no leakage has been registered under the 150 lbs. field test specification, and the authors stated that they had been favorably impressed with the ease of handling and laying these new pipes and also the simplicity in joint-making. The average installation per day was 257 feet, with a maximum of 624 feet in any day.

In making cut-ins the oil tempered spring steel wire actually turned the stellite teeth of the cutter, so the method now is to cut to the wires, burn the wires out with a torch and complete the cutting with the cutter. An interesting test at 230 lbs. pressure placing the concrete shell under gradual stretch type of failure, if any, compared to a sudden rupture; tension caused cracks to open up. Upon reducing the pressure to 200 lbs. these cracks closed up again to water-tightness. The specifications called for 150 lbs. test on the pipe in the trench. In one instance where the pipe was not properly blocked the joint slipped ⅜" without leakage developing through the feathered rubber gasket employed.

"Good Practice in Laying Concrete Pipe," by Louis R. Howson, Consulting Engineer, Chicago.

Mr. Howson listed the several advantages possessed by concrete pipe, the principle ones being the initial high flow capacity and the maintained high coefficient of 140 to 150 in its capacity and low friction loss throughout its life. Safety from the and, the saving of critical materials were other advantages.

Mr. Howson reminded his audience that in installing concrete pipe it was important to select a pipe manufacturer with a history of successful performance. If possible to make a single contract for the complete job of both manufacture and laying of the pipe. As second preference the manufacturer should supply laying supervision and the contractor meet his requirements. Thus, only, could responsibility for pipe failures or joint leakage be fixed. The contract should call for joint responsibility by manufacturer and layer in such instances.

In laying concrete pipe Mr. Howson advocates a flat bottomed trench with final grading by hand. The back-fill should be carried up on both sides of the pipe simultaneously in 6 inch layers, with each being carefully tamped separately. Such tamping should continue to the spring line of the pipe and preferably three quarters way up the sides. The various methods of jointing were briefly discussed and he advocated entrance manholes at roughly 1000 ft. intervals for purpose of pointing up joints, inspection and repair if necessary in the future. He stressed the importance of proper anchoring for unbalanced pressures and prevention of pipe movement in the trench. Leakage from properly laid concrete lines may be expected to be as low as 25 gals. per day per mile for each inch diameter of the pipe.

Col. F. F. Longley, Chief Engineer of the Lock Joint Pipe Co., did not agree with Mr. Howson relative to holding the manufacturer and laying contractor jointly responsible for poor joint making. He suggested that an experienced joint maker be placed on the engineers pay roll for the supervision job. Then the contractor should be held responsible alone. In proper back-filling a good job and a poor job cost almost the same.

Mr. Howson replied that his remarks were not aimed at a company with the record of the Lock Joint Pipe Co., which had a high standing as having done much in advancing the use and adaptability of concrete pressure pipe.

Coating Materials for C. I. Pipes

Studies of Coating Materials for Cast Iron Pipe", by L. G. Lenhardt, Gen'l Manager, Dept. of Water, Detroit.

Mr. Lenhardt's paper, presented by Mr. Gebhardt of his staff, constituted an illustrated report on the Detroit studies of main breaks and their likely causes now assumed to be corrosion attack at points of failure of the coal-tar coating. It was interesting that 50% of the breaks recorded occurred in the coldest months and only 10% in the hottest months. Apparently the pit-cast pipes suffered from corrosion more than centrifugal pipes.

From the accelerated corrosion studies made with available tar coatings the following tentative conclusions have been reached by the Detroit investigators:

(1) A further search is needed for effective hot dip coatings for cast-iron pipe.

(2) Present tar coatings seem inadequate more because of thinness and non-uniformity than from tar quality.

(3) A more effective method of applying the tar so as to seal the laps and voids is needed.

(4) The majority of main failures have occurred in pipe laid during the past 20 years.

H. V. Pedersen, Supt. of Water, Marshalltown, Ia., and H. F. Blomquist, Supt. Water, Council Bluffs, Ia.

Leonard Wood, Sr. Engr., Bd. Water Sup., New York City, and Col. Thos. Wiggin, Consulting Engr., New York City

Elmer S. Blanarik, Water Bd. Chairman; Edw. Taggart, Supt. of Water, Ambridge, Pa., and Joseph Hayes, Penn. Rep., Neptune Meter Co.

Lee Harvey, 41½-Year Supt., Conneaut, Ohio, and Glen Green, Hercules Powder Co., Radford, Va.

Geo. Cissna, Mgr., Neptune Meters, Jacksonville, Fla., and Geo. R. Lowe, Jr., Gen. Mgr., Water Dept., Columbus, Ga.

Fuller Award Society Formed

La Due First President; Blanchard Made Secretary

During the Cleveland meeting of the A. W. W. A. those members attending who had received the George W. Fuller Award for conspicuous services to the water works profession and/or leadership in the Association met to organize what is to be known as the George W. Fuller Award Society of the American Water Works Association. Henceforth, the society will hold its annual meetings during the conventions of the A. W. W. A.

Elected to serve as its first president was Wendell R. La Due, Supt. of Water and Sewerage at Akron, Ohio. As secretary of the Society, Rollo K. Blanchard, Vice President of the Neptune Meter Co., New York, was elected.

AWWA'S WARTIME CONFERENCE IN CLEVELAND

Report of the Water Purification Division Sessions

By HARRY A. FABER*
Editorial Associate

CAPACITY attendance at all three sessions of the Water Purification Division, held during the Cleveland meeting of the AWWA, gave positive proof of the important contributions made by this group. Under Marsden C. Smith, Chairman, a program of high calibre was designed to provide timely information on a variety of water quality problems.

The first session included two committee reports, a paper on new water conditioning processes, a survey of the use of activated carbon, and a discussion of analytical methods for water contaminated with war gases. The entire second session was devoted to the consideration of the role of fluorides in water and to the rather revolutionary recommendation of the medical profession that dental decay may be controlled by the addition of fluorine to municipal supplies. A symposium on water quality standards, comprising the third session, provided an opportunity for thorough discussion of the new U. S. Public Health Service Standards.

Chairman Smith discussed certain problems confronting the Purification Division in its functions and in its relations to the Association. These problems have become intensified with the tremendous growth of the Division and now appear to require clarification. He appointed Norman J. Howard, George D. Norcom, and Paul Weir, Chairman, as a committee to consider this situation and to report their recommendations.

*Research Chemist, The Chlorine Institute, Inc., New York, N. Y.

Later in the meeting the committee submitted the following resolution:

Resolution Affecting the Status of the Water Purification Division

Whereas, the existing by-laws of the Water Purification Division are inadequate in defining the duties, responsibilities, and activities of the Division, and

Whereas, there are uncertainties regarding the administration of committees of the Water Purification Division as between the Executive Committee of this Division and the Water Works Practice Committee, and

Whereas, it is desirable to clarify these relationships,

Now, therefore, be it resolved that the Board of Directors be requested to clearly define these activities and functions which lie solely within the jurisdiction of the Water Purification Division and thereby facilitate the necessary revisions of the by-laws of the Division.

Respectfully submitted,
Special Committee,
N. J. Howard,
G. D. Norcom,
Paul Weir, Chairman.

After discussing this resolution, members unanimously approved the continuance of the special committee to cooperate with the Board of Directors of the AWWA in solving this problem.

Purification Div. Directors

(Top) Marsden C. Smith, Chief Engineer and Supt., Dept. of Utilities, Richmond, Va. (Retiring Chairman of the Division)

(Left) Cecil K. Calvert, Supt. of Purification, Indianapolis Water Co., Indianapolis.

(Right) Gordon M. Fair, Professor of Sanitary Sciences, Harvard Graduate School, Cambridge, Mass.

New Officers

The Water Purification Division elected the following officers to serve for the ensuing year:

Chairman: A. Clinton Decker, Birmingham, Ala.
Vice-Chairman: George J. Turre, Denver, Colo.
Secretary-Treasurer: Chas. R. Cox, Albany, N. Y.
Directors: M. C. Smith, Richmond, Va.; C. K Calvert, Indianapolis, Ind.; G. M. Fair, Cambridge, Mass.

Technical Sessions

Two committee reports were featured in the opening session—the

(1) *Lindy E. Harper, President, Omega Feeders, Kansas City, Mo.*

(2) *Chas. P. Hoover, Chemical Engr., Water Department, Columbus, Ohio.*

(3) *Norman J. Howard, Director of Laboratories, Water Department, Toronto, Ont.*

(4) *H. O. Hartung, Chief Chemist, St. Louis County Water Co., St. Louis, Mo.*

(5) *Geo. J. Turre, Sanitary Engr., Water Board, Denver, Colo. (New Vice-Chairman of the Division)*

(6) *Edmund B. Evans, Supt. of Purification, Water Department, Cincinnati, Ohio.*

(7) *W. "Art" Welch, Nuchar Sales Engr., Ind. Chem. Sales Div., Philadelphia, Pa.*

(1) *"Bob" W. Turner, Dist. Mgr., Rensselaer Valve, Phila., Pa.*

(2) *Peter J. Kelley, Limestone Prod. Co., Newton, N. J.*

(3) *Wm. J. Orchard, General Manager, W. & T. Co., Newark, N. J.*

(4) *Jim Barker, Vice-Pres., Neptune Meters, San Francisco.*

(5) *John Woodson, Natl. C. I. Pipe, Birmingham.*

first by A. Clinton Decker, Sanitary Engineer, Tennessee Coal, Iron and Railroad Co., Birmingham, Ala., and the second by Cecil K. Calvert, Supt. of Purification, Indianapolis Water Co., Indianapolis, Ind.

"Loadings and Capacities for Water Treatment Plants", is the title under which a committee headed by Chairman Decker is collecting data on water treatment plants. The questionnaire will classify information as to design capacity (based on 2 gal. per sq. ft. per min.) and maximum capacity of the filters, as well as characteristics of mixing and settling basis. These data will be correlated with the bacterial loading of the particular plant and will require only a single sheet of paper having ample room for comment on special plant features.

In answer to a question by Norman J. Howard, Toronto, Mr. Decker explained that the accumulated data should enable the committee to formulate a definition of maximum permissible bacterial loadings. Chas. R. Cox, Albany, pointed out that this committee will also consider the scope of high rate filtration and other new developments. E. Sherman Chase, Boston, suggested that data relating to typhoid fever or other water-borne disease rates of the municipality reporting should be given consideration.

"Control of Chlorination", a committee report by C. K. Calvert, Chairman, proposes revised methods to be adopted as standard for the determination of chlorine. All methods which the committee recommends to measure chlorine, to differentiate between chlorine and chloramine, to measure both high and low residuals, and determine the chlorine demand, will be included in one section.

It is recommended that orthotolidine dihydrochloride be used because of its greater purity and solubility. The acid content of the reagent is increased to insure a sufficiently low pH in any sample. New permanent chlorine standards (using no copper sulfate) produce better color matches. The iodimetric titration method is brought back as a standard because it is more suitable for determining high residuals and to avoid errors from interfering substances. Two field methods will be included: the drop dilution method for estimating high residuals, and a method for measuring the chlorine demand of a water sample.

Chas. R. Cox, Albany, complimented Mr. Calvert and his committee of the many improvements incorporated in this report. He stated that, after approval of the report by the Water Works Practice Committee and by the Board of Directors, it is expected that these new procedures will be published in the Journal of the A.W.W.A. and will become the new Standard Methods. Marsden C. Smith, also expressed thanks to the committee for its extensive revision.

"Two New Developments in the Water Conditioning Field", by S. B. Applebaum, Vice-President, The Permutit Co., New York, N. Y.

Both the "Spiractor" and "Demineralizing" processes of water treatment have been described in technical literature, but Mr. Applebaum presented actual operating data on these new methods. The Spiractor constitutes a logical development to reduce the long detention times previously required in water softening, to accomplish more complete precipitation, and to solve the sludge disposal problem. Rights to the U. S. patents covering the process are held by the Permutit Co. and the first large scale plant was installed in this country in 1941.

The Spiractor unit includes a conical tank into the bottom (apex) of which the lime, soda ash, and raw water enter simultaneously, coming in contact with a catalyst such as small limestone granules. The precipitates form rapidly in the presence of the catalyst, to which they adhere as accretions. Thus the Spiractor attains in only 5 to 10 minutes results which the older methods required one to four hours to accomplish, saving space requirements, installation cost, and materials. While older softening methods produced a sludge containing from 85 to 99% of water, the Spiractor sludge (wasted catalyst) usually contains 95% solids and only 5% moisture; it is an almost dry, granular, material easy to dispose of.

Data from four plants, varying from 70 to 2,100 g.pm. in capacity, was presented. Three include pressure Spiractors and thus avoid repumping. Experience to date indicates that the type of water most effectively softened by this process to be the clear, high calcium well waters of over 50 degrees F. temperature, and that units should be operated at a constant rate. The fields to which it is most suited are municipal plants, industrial cooling water treatment, paper mills, and locomotive feed water.

The demineralizing process of removing both anions and cations from water utilizes a new synthetic zeolite designated as De-Acidite. This process enables the production of an effluent which is equal, and often superior, to most commercial distilled water. The cost of producing such water by the zeolite method are generally considerably lower than by distillation methods.

During the past six years a considerable number of plants using this process have been installed for a variety of industrial applications. Capacities of these units range from one to 400 g.p.m. Research work on new and improved applications for

C. C. Wilbur, Luther and Woods, Washington and Carl J. Lauter, Chem. Engr., Filtration Div., U. S. Engineers.

Bushrod Sattler, Comm. Public Utilities, Decatur, Ill. and H. H. Tolburg, Neptune Meters, Springfield, Ill.

"Symons & Son", George (Associate Editor, W. W. & S.) and his Dad. Martin Symons, Chief Engr., Interstate Water Co., Danville, Ill.

(1) *John E. Fresinger, Badgermeter, Cincinnati, O.*

(2) *Ira M. Hoover, Supt. of Water, Montpelier, Ohio*

(3) *Wm. J. Van Reenen, Am. Norit Co., New York City*

(4) *Sg't. Charlie Bushnell, Aviation Instructor Lowery Field, Denver (Formerly with Worthington-Gamon Meters*

(5) *Ralph R. Silver, Advertising, Birmingham, Ala.*

(6) *Ralph Bates, Distr. Engr., N. Y. Dept. of Health, Buffalo*

(7) *A. Cooley Hollwell Badger Meters, Kansas City*

treatment of liquids other than water is being continued.

"The Extent of Use of Activated Carbon", by E. A. Sigworth, Chemist and Technician, Industrial Chemical Sales, West Va. Pulp and Paper Co., New York.

Mr. Sigworth analyzed in detail the widespread use of activated carbon in water purification, basing his study on statistics made available by the recent U.S.P.H.S. survey of treatment plants. Of the 5,372 plants included, 746 plants reported the use of activated carbon in 1941—but the records of his company show some 1,030 plants employed carbon. This discrepancy may be due to the fact that many state health departments do not maintain records of activated carbon usage.

The average carbon dose was found to be 10.6 pounds per million gallons of water treated. A detailed classification showed the dose requirement to vary with the source of the raw water: average use for river supplies being 8.8 pounds per m.g., for creeks 12.7, and for lakes 12.8. Size of the purification plant also affected carbon dose requirements, small plants using 20.3 pounds per m.g. but large plants using only 7.6, probably since dose control is more accurate and costs of material are given more consideration.

The study also revealed that 78% of the plants using carbon applied the dose prior to sedimentation, 19% applied it to the filters, and 3% used a split treatment. Algae still predominate as the major source of tastes and odors and consumers are continually becoming more critical of palatability. Cost of the average 10.6 pound per m.g. dose is about two cents per capita per year.

"War Problems in Analysis and Treatment of Water", by A. M. Buswell, Professor of Chemistry, Univ. of Illinois, Urbana, Ill., with R. C. Gore, H. E. Hudson, and A. C. Wiese, Special Research Assistants, and T. E. Larson, Chemist, State Water Survey.

The senior author presented the results of intensive studies on methods for the detection and removal of several warfare gases from water supplies. The two agents considered most dangerous, mustard and Lewisite, can be detected by means of a chlorine demand test. Data were presented to show that titration of the sample with chloramine—T, under controlled conditions of pH, can be employed to differentiate between these two gases.

Data were also given on the relative threshold odor concentrations of various gases which indicated removal of contaminants to be a large problem. Even though mustard gas, after hydrolysis, is not toxic, water so contaminated may be unfit to drink. Very large doses of activated carbon were required for removal of the gases studied.

Laboratory studies on the removal of inorganic arsenic from water by coagulation showed ferric sulfate to be much superior to alum. Filtration proved of little value, as most of the contaminating material removed was present in the settled sludge.

Symposium on Fluorides and Dental Health

"Domestic Water and Dental Caries", by Dr. H. Y. Dean, Senior Dental Surgeon, U. S. Public Health Service, National Institute of Health, Bethesda, Md.

Dr. Dean presented a comprehensive review of the extensive problem of tooth decay, commenting on the well known undesirable effects associated with waters high in fluorides. It is not so widely realized that small concentrations (0.1 to 1.0 ppm. fluorine) probably contribute to dental health. Some five hundred millions of dollars are spent yearly for dental work—but this provides care for only a minority of the U. S. population. It appears that drastic reduction in dental caries can be accomplished only by mass control methods.

About 1916, early studies revealed that mottled enamel incidence was accompanied by freedom from dental caries. Surveys in Galesburg and Quincy, Ill., indicated much lower intensity of caries in the former city where the water contained 1.8 ppm. Large scale studies were next conducted in the Chicago area, where some municipalities use water from Lake Michigan and some use wells as their source of supply. Extensive dental examinations of school children indicated dental caries to be markedly reduced when the water supply contained fluorine. Studies extended to more than 20 midwestern cities confirmed this fact.

Dr. Dean pointed out that, theoretically, control of dental caries could be accomplished by the addition of fluorides to provide up to 1.0 ppm. Undesirable cumulative effects of such treatment are unlikely since many people have long used water containing higher concentrations of fluorides. He recommended that carefully controlled studies be made, before such treatment is generally adopted, in order to carefully determine the effect of fluorine addition.

"The Public Health Significance of Dental Deficiences", by Dr. H. J. Knapp, Health Officer, City of Cleveland, Ohio.

For many years Cleveland has been conscious of dental deficiencies and, in 1935, completed extensive statistical studies. The results show that about 80% of all Cleveland grade school children do have dental caries. To date the control of this condition is largely through detection and corrective methods. The possibility of mass control of disease is always of interest to public health officers.

There are still other influences which might affect the incidence of caries and which should be given

consideration: in adequate diet, sunshine, lack in constituents of food or water, and even prenatal conditions. It must be recognized that the teeth are but one organ of the human body, and extensive physiological studies should accompany the addition of fluorine to water supplies. Dr. Knapp advised an open mind on this new departure, recommending that the water works profession should be neither the first to reject nor the last to accept such progress.

"What Are the Responsibilities of Public Water Supply Officials in the Correction of Dental Caries"? by Dr. Abel Wolman, Professor of Sanitary Engineering, Johns Hopkins University, Baltimore, Md.

Dr. Wolman analyzed the implications of Dr. Dean's conclusions (that sound reasons indicate mass treatment of dental caries could be accomplished by the addition of fluorides to water supplies) and stressed the responsibilities of the water works profession. It has been necessary to overcome technical and legal difficulties, in the addition of everything from alum to chlorine, to make progress in water purification. In every instance, fortunately, the results have been advantageous to the public health.

Present treatment processes are all directed to the removal of undesirable substances from water. Now, however, it appears that the profession is literally being pushed into adding some substances as well as eliminating others. Theoretically, there is no reason not to go further, since we are accustomed to providing a tailor-made water supply, or to automatically bar new suggestions.

Dr. Wolman recalled experience some twenty years ago with the addition of iodine to the Rochester, N. Y., supply—and cited the sound reasons why this was not long continued. The addition of fluorides, however, would appear to provide the desirable mass effect. During the next few years, while this possibility is studied, the water works profession should consider all evidence carefully.

"A Program of Treatment of Public Water Supply to Correct Fluoride Deficiency", by Dr. David B. Ast, Assistant Director for Oral Hygiene, N. Y. State Dept. Health, Albany, N. Y.

It is proposed to introduce nontoxic doses of sodium fluoride into public drinking waters to test the fluorine-caries hypothesis, which points to an inverse ratio of caries to fluorides present in the water. One municipal supply would be so treated while the comparable supply of another municipality would be used as a control. The practicability as well as the results of such a plan, studied over a period of from 10 to 12 years, may thus be determined.

After careful selection of the areas, dental examination should be made of all children through age 14, in both the control and study areas. These checks should be repeated annually throughout the decade or more of investigation. Two communities in New York State, of about thirty thousand population, have already been surveyed for this purpose.

To supply a dose of 0.8 ppm. fluorine will require the addition of 1.77 ppm. sodium fluoride (14.7 lb. per m.g.). This material is listed at $7.75 per 100 lbs. in 100 lb. quantities. There will be no interference between chlorination and the addition of sodium fluoride to the water supply, but the fluoride should be added to filtered water so that none would be removed by coagulation. Solution feed devices, such as those used for alum or hypochlorite addition, will be suitable for feeding sodium fluoride. Samples of water from the distribution system will be examined for fluoride content, as an additional check.

The New York State Department of Health has approved this study, at a total cost of about $6,000 per year. Problems of public psychology and certain questions regarding administration are now being worked out.

Symposium on Water Quality Standards

"The Dominion of Canada Standard", by Norman J. Howard, Director of Water Purification Filtration Plant, Toronto, Ont., Canada.

Mr. Howard criticized the new Dominion of Canada regulations as ambiguous and of uncertain legal status. The Federal authorities did not consult the Provinces of Ontario or Quebec in formulating the standards, but the provinces are given direct control of public health. Provincial health departments and individual plant laboratories use the U. S. Treasury Department standards and "Standard Methods" almost exclusively. Recently there have been indications that the Dominion may revise its standards, giving more consideration to accepted practice.

"The U. S. Public Health Service Standard"

(These new Standards adopted by the Public Health Service, September 25, 1942, are given in detail in Reprint No. 2440 of the Public Health Reports and are obtainable from the Supt. of Documents, Washington, D. C., at 10 cents per copy. This reprint includes both the Drinking Water Standards and the Manual of Recommended Water Sanitation Practice. A copy should be available in every water works laboratory.)

"From the State Sanitary Engineer's Viewpoint"—F. H. Waring, Chief Engineer, State Dept. of Health, Columbus, Ohio.

Mr. Waring recited numerous difficulties and impracticabilities of the new standards as they affected laboratory work of the State Health Department. The accuracy involved does not seem to warrant the requirement of testing 100 ml. portions, especially since these require extensive changes in equipment and add considerably to the cost of culture media. There are many instances in which analysis of samples cannot be started within twelve hours of collection; temperature control is almost impossible with facilities available; and the value of dechlorinating samples is questionable. Increased frequency of sampling adds a considerable burden, as many Ohio municipalities using well supplies have no laboratory facilities. The fluoride limit of 1.0 ppm. seems too low—the State not recommending fluoride removal unless a minimum of 2.0 ppm. is present. In Mr. Waring's opinion, the limit for iron and manganese should be at least 0.5 ppm. for the two taken together, and the limits set for alkalinity and pH appear to restrict lime-soda softening of water supplies.

"From the Plant Group Viewpoint"—George D. Norcom, Cons. San. Engr. and Chemist, New York, N. Y.

Mr. Norcom pointed out that it is still early, from the standpoint of both time and experience, to judge the new standards. He considered questionable the dechlorination of samples after 20 minutes, when water may be consumed 5 minutes after chlorination. All samples are to be taken from the distribution system, but coliform organisms may enter from reservoirs, standpipes, etc.—what sanitary significance should be attached to these? Increased laboratory facilities and gasoline consumption seem essential in order to comply with distribution system sampling requirements. While the intent of the standards is commendable, it appears that nothing less than complete filtration works must be supplied in many instances, reservoirs must be covered, etc., in order to comply.

"From the Operator's Viewpoint"—R. F. Goudey, San. Engr., Dept. of Water and Power, Los Angeles, Calif.

Mr. Goudey also felt the slight additional refinement due to use of larger volumes for bacteriological tests was not justified. The number of samples required may increase those taken in small municipalities, but reduce those in many large cities. During an intensive survey over the last six months, the city of Los Angeles has located and eliminated thousands of cross connections. Sanitary defects must be corrected if bacteriological standards are to be met. He urged strongly that bacterial media and methods be improved.

"From the Operator's Viewpoint"—by C. K. Calvert, Supt. of Purification, Indianapolis Water Co., Indianapolis, Ind.

Mr. Calvert called attention to the fact that these new standards specify frequency of sampling on the basis of population of the municipality in which the supply is located, though designed to apply to common carriers. Water works authorities are anxious to improve water quality, but the improvement due to use of 100 ml. samples is insignificant. Basing water quality on the distribution system samples is correct in principle, but protection against back siphonage and cross connections is extremely difficult. He recommended consideration of tryptose laurel sulfate broth as an improved bacteriological media. Not only will the maintenance of residual chlorine in distribution systems prove difficult, but residual chlorine tests should refer to the latest edition of Standard Methods.

"Resume"—Chas. R. Cox, Chief, Bureau of Water Supply, Div. of San., State Dept. of Health, Albany, N. Y.

Mr. Cox stressed the fact that the Revised Treasury Standards are separated into two portions, one containing the statement of the standards, the larger portion constituting a recommended manual of water works practice. He stressed the fact that modern chlorination practice may be much more effective than is implied in the "Manual". The development of break-point superchlorination actually constitutes a new era of paramount importance in the treatment of raw waters. Excess chlorinator capacity, at least 50% above the highest expected dose requirement, should be provided; limited capacity may constitute a serious bottleneck. The new standards are not easy to meet, but they are on the side of safety.

"Resume"—by J. K. Hoskins, Sr. San. Engr., U. S. Public Health Service, Washington, D. C.

Mr. Hoskins reviewed the difficulties met and the compromises necessary in establishing the new standards. It is important to recognize that this is not intended to be a static document, but that improvements will be considered and incorporated into the standards.

The question of whether to set standards low or high must always be faced; it was felt that the latter choice is the wiser one, even though all supplies cannot now (or perhaps ever) meet the high standards. Some state laboratories appear unable to meet the sampling requirements, but again it appears justified to raise the level of practice. It may be necessary to provide decentralized laboratories in order to obtain greater rapidity and accuracy of results. The matter of "provisional approval" is admittedly a weakness, but is intended as a temporary arrangement to provide time for improvements to be made.

Several discussors further commented upon the difficulties of immediately complying with these standards and suggested the certifying officers be allowed reasonable latitude. They were assured by Mr. Hoskins that this would be done.

Sewage Federation Program Planned to Interest Many

The following are a few of the highlights of the Fourth Annual Conference of the Federation of Sewage Works Associations to the Hotel Sherman in Chicago, October 21-23:

An appraisal of sanitation activities in Latin-America, with particular emphasis on opportunities for American engineers and manufacturers in the development of sewage treatment facilities, will be one of the features at the conference. The speaker will be Gordon M. Fair, Professor of Sanitary Engineering, Graduate School of Engineering, Harvard University and Consultant to the Division of Health and Sanitation of the Office of Inter-American Affairs.

Professor Fair, one of this country's foremost authorities on sanitation practice, will base his talk on information gained in a 15,000-mile trip through South and Central America. Traveling as an official representative of the Coordinator's office, which is now engaged on a huge program of public health work, he has had an unequalled opportunity to study all phases of sanitation development in Latin America.

Tremendous industrial expansion resulting from the war has brought new and complex waste disposal problems to the doorstep of every community and specifically to the operators of sewage treatment facilities. What these problems are, and some of the ways in which they may be handled, will be outlined by Dr. F. W. Mohlman, Director of Laboratories of the Chicago Sanitary District.

Some of the new developments that Dr. Mohlman will discuss, such as those concerned with wastes from vegetable dehydration plants, have important post-war implications. Thus, his report will hold special interest for manufacturers, as well as engineers and operators.

Operators and municipal officials attending the three-day meeting will be provided with an excellent opportunity to clarify their thinking on many war-time problems. For example, A. M. Rawn, Engineering Consultant to the War Production Board and Vice-President of the Federation, will be on hand to interpret the latest information on priorities procedures and other regulations.

There will be especial attention directed to maintenance and operation of sewage disposal facilities under present conditions, and, there will be an "Operator's Round-Table" breakfast session under the guidance of experts.

An Omission

(And Our Apologies to Cooper-Bessemer)

In compiling the Index of Classified Products which appears in the forepart of the 1943 Reference and Data Number of *Water Works and Sewerage*, the name of The Cooper-Bessemer Corporation of Mt. Vernon, Ohio, was omitted.

This advertiser should have been listed as a supplier of gas and Diesel engines, the well known rugged Cooper-Bessemer Gas Engines being used for power generation from sludge gas at sewage treatment plants.

We are at a loss to effectively explain this omission and take this opportunity to express our regrets.

A RAPID METHOD FOR DETERMINING GREASE IN SEWAGE AND SLUDGES*

By HARRY W. GEHM
Associate
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N. J. AGRICULTURAL EXPT. STATION
NEW BRUNSWICK, N. J.

The Author

THE limitations of most methods for determining grease in sewage and sludges are time, intricate technique and special apparatus required, and therefore relatively few plant data are available on this very important phase of sewage treatment. Specific information on the relative merits of various processes for removing grease is, likewise, sparse, yet rare is the plant where grease does not present an operating problem of some kind. Cantonments and institutions are particularly beset by grease problems.

Aside from the specific difficulties arising from grease in sewage, the fact that sewage solids in themselves contain a high percentage of grease indicates that any treatment to which sewage is subjected for clarification and purification is concerned with handling grease. Inspection of the data presented in Table I, forcefully bears out this observation, because about one-third of the total suspended sewage solids and about one-half the non-settleable solids consist of lipoidal matter. The results reveal the importance of grease in sewage treatment and show why further information concerning it would prove useful for advancement in sewage treatment methods.

Previous Work

The standard method[1] for determining grease in sewage is a cumbersome procedure for plant operation, involving evaporation of the sample and a lengthy extraction. These disadvantages, together with the fact that reliable results are not obtainable by the method, have made grease determinations unpopular even with trained personnel having the necessary laboratory facilities and time available for such investigations.

During the last five years, several attempts have been made to shorten the procedure and improve grease extraction. Pomeroy and Wakeman[2] have developed a wet extraction method to a high degree, obtaining good checks with considerably shortened time required. The disadvantage of the "wet" method is the special apparatus and intricate technique involved, factors which do not enhance the possibilities of its adaption to popular use.

Okun, Hurwitz and Mohlman[3] also developed a method involving wet separation plus dry extraction. This method was shown to be a decided improvement over the standard method. Although the technique is less involved than the Pomeroy-Wakeman method it is relatively time consuming.

Gehm and Trubnick[4] have described a method for determining grease in sludges and Gehm[5], one for sewage. Both these methods involve a lengthy extraction period and some rather refined points of technique.

In developing the methods mentioned above, the authors were more concerned in obtaining accurate and reproducible results than in simplification. The success of the method is evidenced by the supporting data presented. The method has been simplified to some extent, but not to a sufficient degree to interest the sewage plant operator in attempting grease analysis.

In observing some experiments in which mineral oil was added to dry sewage sludge, the writer was struck by the rapidity and thoroughness with which the oil wetted the sludge. This suggested the possibility of an oil extraction. Some simple tests revealed the following points:

(1) Practically all the fats could be extracted from dry sewage matter by treatment with mineral oil at temperature around 130° in a short period of time. At this temperature the oil is above the melting point of all the common fats, which under these conditions, are soluble in it or miscible with it.

(2) Soaps present behave in the same manner as fats; therefore, no acidification is required to convert them to fatty acids.

(3) Residual mineral oil is readily removed from the sludge by a rapid wash with a solvent. Ethyl ether proved the best for this purpose.

New Method for Grease in Sludge

Following further experimentation on several details of technique the following method was developed for determining grease in sludge by oil extraction. This technique, set forth in steps below, includes a procedure for obtaining a dry sludge sample in about an hour.

(1) Prepare an 8 cm. Buchner funnel with a wet 11 cm. Whatman No. 5 filter paper which has had the edges cut so that they extend up the wall of the filter.

(2) Pour sample of wet sludge, containing between 1 and 2 grams of dry solids, evenly on paper in filter and apply vacuum until drainage is complete.

(3) Remove paper from filter, peel off sludge, place on a watch glass and dry in 105° C. oven for at least 45 minutes.

(4) Grind dry samples of activated sludges, humus sludges and ripe sludges to a powder in a small mortar. Cut fresh solids samples into fine shreds, with a sharp scissors.

(5) Weigh a sample of 0.5 gram for fresh solids, or 1.0 gram for other types of sludge, and place in a 50 ml. beaker.

(6) Add 30 ml. of light mineral oil (U.S.P.), to the beaker. Place a short stirring rod equipped with a policeman in the beaker, and bring the contents to between 130° and 140° C. on a hot plate or over a burner. Maintain this temperature for 15 minutes, stirring the contents

TABLE I
GREASE CONTENT OF SEWAGE SOLIDS

Source of Sewage	—% Grease in Dry Solids— Total Suspended Solids	Settleable Solids	Non-Settleable Solids
South River	40	28	63
Sayreville	39	37	40
Elizabeth	33	29	43
Bernardsville	33	38	67
Morristown	31	24	70
Rahway	38	33	44
Madison	42	28	62
Highland Park	29	27	30
Average	36	31	52

*A Journal Series Paper, New Jersey Agricultural Experiment Station, Rutgers University, New Brunswick, N. J. Written for publication in "WATER WORKS AND SEWERAGE."

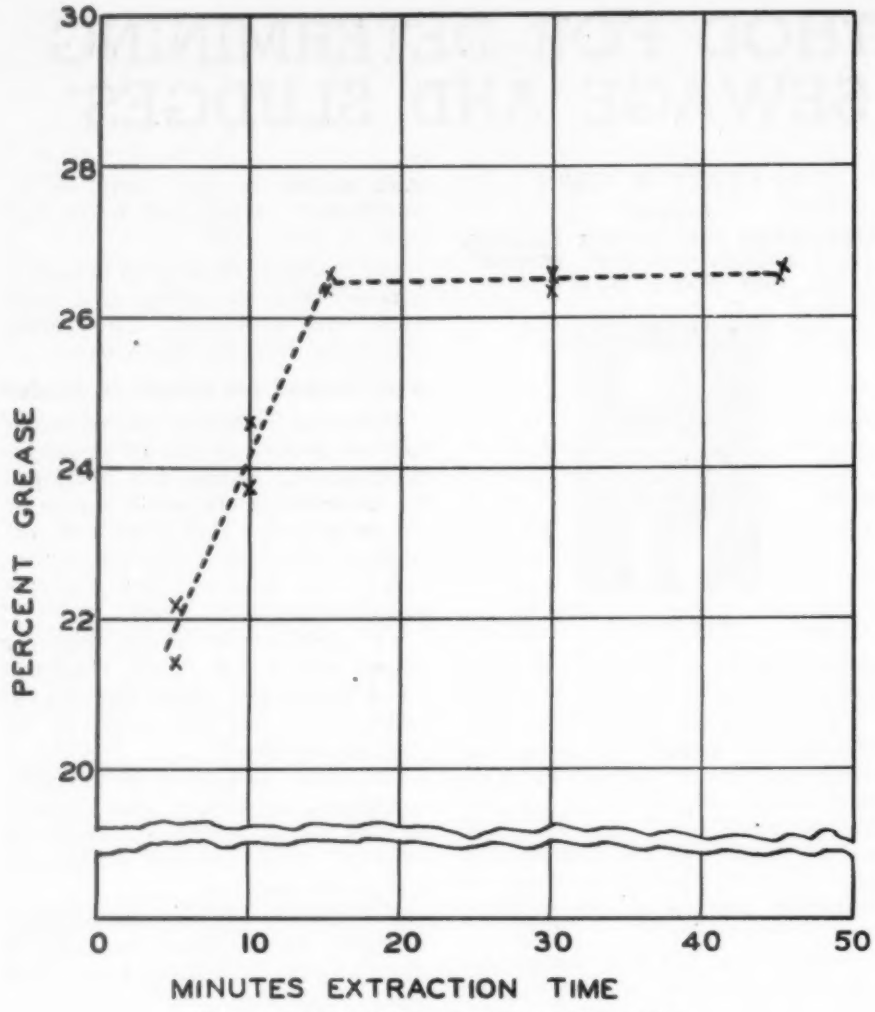

Fig. 1—Effect of Time on Grease Extraction

of the beaker thoroughly several times during the period.

(7) Prepare a bitumen type gooch crucible with an asbestos mat 1/32" thick; dry at 105° C. and weigh.

(8) Fit the gooch crucible to an adapter on a vacuum flask and pour the oil from the beaker into the crucible. Apply a vacuum for filtration. Allow heavy solids to remain in the beaker.

(9) Add 15 ml. of mineral oil to the solids remaining in the beaker and heat to 130°-140° C. on a hot plate.

(10) Transfer residue and oil to crucible with aid of glass rod and policemen. *(No smoking or open flames.)*

(11) Fill beaker with ethyl ether and when oil has completely passed through crucible place stirring rod directly on residue in crucible and pour ether slowly from beaker down the rod. This avoids splattering of the still warm residue when the ether comes in contact with it. Transfer any solids remaining in the beaker to the crucible with the ether.

(12) Fill the crucible with ether three times allowing it to drain each time.

(13) Wipe the outside and inside rim of crucible with an ether moistened cloth to remove any mineral oil which may have crept along the surfaces.

(14) Dry for 15 minutes in the 105° C. oven. Cool in desiccator and weigh.

(15) Calculation

Wt. of Crucible and Residue—
Wt. Crucible = Wt. Residue;
Wt. of Sample—
Wt. Residue = Wt. Grease;

$$\frac{\text{Wt. Grease}}{\text{Wt. Dry Sample}} \times 100 = \% \text{ Grease on Dry Matter Basis.}$$

Experience has shown that six such determinations performed simultaneously can be completed in approximately two hours starting with wet samples. If dry samples are available, such as residues from solids determinations, a like number of extractions can be made in less than one hour.

Results obtained, in this laboratory, with the above method on various types of sludge as compared to results of the Gehm-Trubnick acidification-petrolic ether extraction method are presented in Table II. Inspection of these data shows that the two methods give substantially the same results. It cannot be stated which method gives the most accurate results, but inasmuch as more is known about the acidification-petrolic ether extraction and inasmuch as it is recognized at present, that method may be taken as the basis for evaluating the new method. Although the differences between the results were within quite reasonable limits the per cent deviation of the oil extraction from the ether extraction was quite high in at least four instances and relatively high in four other instances. Even including these the average deviation was only 1.67 per cent on all tests.

Because reasonable agreement was obtained, it appears that the new method is of sufficient accuracy for plant work. This is substantiated by

TABLE II
RESULTS OF ANALYSES OF SLUDGES BY PETROLIC ETHER AND MINERAL OIL EXTRACTION METHODS

Type Sample	Collected From	% Total Grease in Dry Solids — Petrolic Ether Extraction	Mineral Oil Extraction	Difference P.E.—M.O.	Per Cent Deviation*
Fresh Solids	Rahway	23.9	23.7	—0.2	— 0.83
Fresh Solids	Highland Park	22.4	22.2	—0.2	— 0.89
Fresh Solids	South River	28.9	28.3	—0.6	— 2.08
Fresh Solids	Elizabeth	25.2	25.2	0.0	0.00
Fresh Solids	Spring Lake	35.1	35.6	+0.5	+ 1.42
Fresh Solids	Middlesex Boro	15.7	15.6	—0.1	— 0.63
Ripe Sludge	Rahway	5.0	4.9	—0.1	— 2.00
Ripe Sludge	Highland Park	6.3	6.8	+0.5	+ 7.94
Ripe Sludge	Freehold	7.1	7.0	—0.1	— 1.41
Ripe Sludge	Morristown	4.1	5.3	+1.2	+34.20
Ripe Sludge	Spring Lake	9.2	8.8	—0.4	— 4.34
Ripe Sludge	Plainfield	7.2	7.2	0.0	0.0
Activated Sludge	Bernardsville	11.4	13.5	+1.9	+16.7
Activated Sludge	Tenefly	6.2	5.8	—0.4	— 6.45
Activated Sludge	Milwaukee	7.5	6.7	—0.8	—10.7
Activated Sludge	Hillsdale	10.7	9.9	—0.8	7.47
Humus Sludge	Manville	6.2	7.5	+1.3	+20.9
Humus Sludge	Glen Gardner	5.3	5.4	+0.1	+ 1.89
Humus Sludge	Freehold	11.4	12.5	+1.1	+ 9.65
Scum	South River	61.4	64.3	+3.1	+ 5.04
Trickling Filter Film	Manville	27.8	27.6	—0.2	— 0.72

*Based on Petrolic Ether as correct value.

the fact that triplicate analyses on the same samples made by the mineral oil extraction method checked within practical limits as evidenced by the data shown in Table III. Here the greatest per cent deviation from the means of three determinations was 7.70 per cent which is no greater than deviations observed between triplicate samples run by other methods.

Thoroughness of grease extraction by heating 15 minutes with mineral oil at 130° to 140° C. is evidenced by results of an experiment in which sets of duplicate samples were analyzed with heating time of 10, 15, 30 and 45 minutes. Shown graphically in Fig. 1, the figures prove that extraction is incomplete in less time, and no more complete in three times the selected time.

(7) Weigh dry residue in a 50 ml. beaker.

(8) Proceed with oil extraction as outlined under sludge analysis, steps 6 to 15.

(9) Calculation:

$$\left[\begin{matrix}\text{Weight of crucible and}\\ \text{residue in gm.}\end{matrix}\right] - (\text{Weight of Crucible in gm.}) = (\text{Weight of Extracted Mat})$$

$$\left[\begin{matrix}\text{Weight of Filter-Aid}\\ \text{Precipitate Mat in gm.}\end{matrix}\right] - (\text{Weight Extracted Mat. in gm.}) = (\text{Weight of Grease in gm.})$$

$$\frac{\text{Weight Grease in gm.} \times 1000}{4} = \text{p.p.m. grease in sewage.}$$

Application of this method to five sewage samples yielded the results presented in Table IV. No effort was made to amass a large amount of data for sewage as the relative completeness of grease extraction by mineral oil was well demonstrated on the numerous sludge samples. It will be noted that the results of this method as compared to the former method[5] were consistently lower to the extent of approximately 8.5 per cent. Triplicate analyses of two of the samples showed that reasonably good checks could be obtained, as the greatest deviation from the average value was 6 p.p.m.

The lower figures obtained by the mineral oil extraction may be due to retention of some of the grease by the coarser sewage particles or retention of a small amount of mineral oil by the filter-aid. As no grease method is absolute and as results with this method are consistent, the lower results obtained as compared with the former method are not considered a serious limitation.

TABLE III
RESULTS OF TRIPLICATE ANALYSES

Sample	% Total Grease 1	2	3	Maximum Deviation From Mean	Maximum Per Cent Deviation From Mean
Fresh Solids	24.7	24.2	23.7	±0.5	2.07
Ripe Sludge	3.7	4.2	3.8	±0.3	7.70
Activated Sludge	14.0	14.1	13.5	±0.4	2.88
Trickling Filter Film	27.8	27.6	27.8	±0.1	0.36

Procedure for Grease in Sewage

The satisfactory results obtained with mineral oil extraction of grease from sludge indicated that this procedure could be applied for the same purpose to sewage. To obtain a sample for extraction rapidly the method described by Gehm[5] was employed. This method is outlined below with slight modifications.

(1) Pour a four-liter sample of sewage into a tall jar of five liter capacity and disperse about 1 gram of filter aid in the sewage.

(2) Add, with constant stirring, a volume of filter alum solution sufficient to give a concentration of 300 p.p.m. of alum ($Al_2SO_4 \cdot 18H_2O$).

(3) Allow floc to settle and siphon off clear supernatant. If scum is present, do not siphon it off, but allow it to remain with the precipitate.

(4) Prepare an 8 cm. Buchner funnel with an 11 cm. Whatman filter paper as employed for analysis of sludges.

(5) Pour alum precipitate on filter and apply vacuum until mat has drained completely. Wash adhering residue from jar into a little distilled water. Wash down sides of funnel with water from wash bottle to remove adhering residue.

(6) Scrape filter-aid mat containing sewage precipitate from paper to watch glass and dry in oven at 105° C. for one hour.

Equipment Required

Equipment necessary for application of this method for both sewage and sludges is as follows:

Analytical Balance
Oven
Hot Plate
Aspirator or Vacuum Pump
Thermometer (0 to 150° C.)
Jars (5 liter capacity)
Graduated Cylinder (1 or 2 liter capacity)
Beakers (50 ml. capacity)
Spatula
Glass Rods
Rubber Policemen
Gooch Crucibles (Bitumen Type)
Crucible Adapters
Desiccator
Vacuum Flasks
Watch Glasses (100 cm. diameter)
Buchner Funnels (8 cm. inside diameter)
Filter Paper (Whatman No. 1, 11 c.m.) (Whatman No. 5, 11 c.m.)
Fitler Aid (Celite, Dicalite or similar type)
Alum ($Al_2(SO_4)_3 \cdot 18H_2O$)
Asbestos (Gooch Crucible Grade)
Ethyl Ether, (U. S. P.)
Mineral Oil (light)
Wash Bottle
Scissors
Small Mortar and Pestle

Most of these items are available in any fairly well equipped sewage plant laboratory. The chemicals with the exception of the filter aid are available in drug stores. Any laboratory supply house will furnish the filter aid. The alum used is ordinary filter alum.

The only unusual piece of equipment employed is the bitumen type Gooch crucible. This was selected because the large filtering area and large underdrain holes provide rapid filtration. The ordinary type of gooch is satisfactory for some samples but plugs with others. This bitumen type of crucible gave excellent results and, as it is readily available from most supply houses at a low price, is recommended for this purpose. (Eimer and Amend Cat. No. 8-215.)

Summary

A rapid method for determining grease in sewage and sludges has

TABLE IV
COMPARISON OF GREASE ANALYSIS OF SEWAGE BY NEW AND FORMER METHODS

Sewage Samples	Grease—p.p.m. By Oil Extraction 1	2	3	Ave.	By Petrolic Ether Extraction	Difference
South River	64	67	63	65	72	7
Sayreville No. 1	95	..	..	..	101	6
Sayreville No. 2	110	121	118	116	126	10
Highland Park	39	..	..	..	43	4
Marlboro	72	..	..	..	79	7

been developed using mineral oil as an extractant. Results on dried sludges can be obtained at the rate of six in less than one hour. Analysis of an equal number of wet sludge samples can be completed in about two hours. Six sewage samples require three hours. Satisfactory checks were obtained between this and the acidification-petrolic ether extraction now in use in this laboratory. The method offers distinct possibilities for routine determination of grease in sewage or sludge.

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John W. Alvord, Noted Water Engineer, Is Dead

John Watson Alvord, pioneering senior member in the engineering firm, Alvord, Burdick & Howson of Chicago, died at his summer home, Douglas, Mich., on July 31, 1943, at the age of 82, after a brief illness.

Mr. Alvord since 1894 had been engaged in private practice as a consulting engineer with headquarters at Chicago. In cooperation with his partners he had served upward of 300 municipalities, widely scattered throughout the United States, in matters particularly relating to public water supply and sewerage, including many water and sewage treatment plants. He was largely concerned with the finances and valuation of water works properties and was frequently employed as a member of appraisal boards in matters of valuation.

Mr. Alvord served as a member of a large number of important engineering commissions, and during the previous World War was supervising engineer at Camp Grant, Ill. He was also chief engineer of the U. S. Housing Corporation from 1917 to 1919.

Mr. Alvord was Past President of the American Water Works Association; honorary member, American Society of Civil Engineers; Past President and honorary member, Western Society of Engineers; member, American Institute of Consulting Engineers; member, Institution of Civil Engineers, Great Britain; fellow in the American Association for the Advancement of Science; member, Sons of American Revolution and Society Mayflower Descendants. The honorary degree Civil Engineer was conferred on him in 1913 by the University of Wisconsin.

He was a member of the Union League Club, the Chicago Engineers Club, and the University Club of Winter Park, Fla., where he had maintained his winter home for several years. In 1916 he founded and endowed the Washington Award of the Western Society of Engineers for pre-eminent services in promoting the public welfare.

Spartanburg Reduces Water Rates

From "Out of the Spigot" comes a story by R. B. Simms, Supt. of the Spartanburg S. C. Water Works that The Water Commissioners of that city have reduced the water rates by five per cent. The statement of the commissioners, "While we wish it could be larger, still we are ever mindful of the service involved, consisting of *quality*, *quantity*, and *price*, in the order named," is indeed remarkable in these days of rising prices coupled with decreased service in other lines of business.

Spartanburg is the city where the sewage plant was increased to take care of the waste of Camp Croft. (See WATER WORKS & SEWERAGE for July.) This camp and war industries also have placed an additional load of about sixty-five per cent on the water plant. The water plant which was also enlarged has been able to meet the demand.

The reduction in water rates is possible because of the increased revenue, and applies even to the minimum charge.

Chicago Gets Needed Priorities to Complete Filter Plant

W. P. B. has promised Chicago that the priorities on equipment and materials needed to complete the Chicago Filtration Plant will be granted.

Building contracts were let in July and bids on machinery and equipment, being taken early this month, will run to $250,000. Bids on pumping equipment will be delayed until a later date because of no early need.

It is the intention of Public Works Commissioner Oscar Hewitt to have the new plant completed and operating within a year in order to combat the increasing lake pollution brought about by the extent of war industry along the southern end of the lake and reduced water diversion through the drainage canal.

Coatsville Sludge Produces Record Tomato Plants

The following constitute excerpts from a news item which appeared in the Coatesville (Pa.) Record of July 28, 1943, telling of the growth of a sludge grown tomato plant which put the best grown Victory garden plants in the background.

"It looks as if the Coatesville victory gardeners who have been boasting about how many tomatoes they have raised on one vine will have to take a back seat. The boasting started when one gardener announced that he had a vine with twenty-seven tomatoes on it. It wasn't long before another popped up with a vine with thirty-two tomatoes on it. Finally the score got up to forty and that appeared to be the end.

"But now comes a report of a vine containing fifty-six tomatoes, that is not in a victory garden or any other kind of a garden for that matter. In fact, this particular vine has a rather uncertain ancestry. It did not grow from seed advertised in a highly colored seed catalogue.

"This particular seed was one of thousands of others that found their way to the Coatesville sewage disposal plant. It went through the digesting process and was finally thrown out with the sludge on the sludge pile.

"A couple months ago Howard Haws, caretaker at the plant, pulled up a half dozen of these plants, including this champion producer, from the sludge heap and planted them along the fence. The only fertilizer they got was the ball of sludge that clung to their roots when they were pulled up. But this is powerful stuff and any one of the half dozen plants would make the victory garden champions look like pikers."

If this story doesn't create a run on Coatesville sludge in 1944, we don't know what will.

"Clear-o-Sludge"

In three months Clearwater, Fla., has sold $375 worth of "Clear-o-Sludge," made from digested sewage sludge mixed and ground with leaves. Some 22½ cu. yd. are made each month and sold for $2.50 a yard. Analysis shows the mixture to contain only 1.05% of nitrogen and 73% ash. Although the nitrogen content is less than that of most digested sludges, it would seem that the material is popular with the residents of the city, considering the amount that has been sold. Or possibly this popularity can be traced to good salesmanship on the part of someone in the Clearwater sewage works organization conceiving the slogan "Leaves for the leafy!"

OHIO CONFERENCE ON SEWAGE TREATMENT

Discusses Sewage Treatment Problems Under War Time Conditions

A Report by
GEORGE E. SYMONS
Assoc. Editor

MEETING in Mansfield, Ohio, on June 23, the 17th Annual Ohio Conference on Sewage Treatment, was a one day meeting attended by approximately 90 persons. Wartime operation problems were featured on the program.

At the business meeting the following officers were elected for the ensuing year:

Chairmen

(Retiring) "Art" Niles, Supt., Treatment, Toledo

(Incoming) "Dick" Snyder, Supt., Treatment, Massillon

R. F. Snyder, Massillon, Chairman.

J. R. Turner, Mansfield, Vice Chairman.

D. D. Heffelfinger, Alliance, Secretary.

L. B. Barnes, Bowling Green, Member Board of Control.

A round table discussion was held on four topics during the morning session.

War Time Effects on Sewage Plants

T. C. Schaetzle, Plant Supt., Akron, noted the changes in composition of the sewage at Akron since the war began in Europe. In September, 1939, the suspended solids content was 262 p.p.m., but a month later the suspended solids averaged 335 p.p.m. The following year the concentration had decreased slightly but has remained above 314 p.p.m. and this year has averaged 331 p.p.m.

The designed capacity of the Akron plant was 33 m.g.d., with an expected sludge load of 25.4 tons per day. In 1938 the flow was 36 m.g.d. with a sludge load of 42.8 tons per day. In 1942-43 the flow has been 55 m.g.d. with a sludge load of just 86.4 tons per day. The increase can be directly attributed to rubber reclaiming and synthetic rubber plants. This fact was amply demonstrated during a five day rubber plant strike when the suspended solids dropped from 339 p.p.m. to 181 p.p.m. and the B.O.D. dropped from 185 p.p.m. to 96 p.p.m.

The heavy overload has necessitated the building of lagoons to act as sludge digestion tanks and has required additional pumps which have been obtained with difficulty.

Because the specific gravity of the spongy synthetic rubber crumbs is just slightly less than 1.0, a large part of these suspended solids go through the plant. Those particles which settle out cause the sludge to be light and fluffy.

Hosts

Wm. J. Locke Mayor Mansfield, O.

J. R. Turner Supt. Sewage Mansfield, O.

(In the July issue they were from Ephrata, Pa.—Our apologies!)

In addition to the rubber wastes, the Akron plant has received shots of heavy oil, also shots of colored wastes, and wastes of high alkalinity. Oil to the amount of 34 cu. yds. was received in two days. All of these problems add to the difficulties of operating the Akron plant, which Mr. Schaetzle said is also troubled with foaming.

Sampling Problems and Methods

C. D. McGuire, Supt. of Sewage Treatment, Columbus, gave some rules for sampling and compositing. These covered the sampling point, number of samples to be collected daily, proportioning the sampling to the flow, and temperature of sample storage. Hand sampling should be as nearly mechanical as possible in that it should be done in exactly the same way each time; that is, at the same point, with the same technique.

Mr. McGuire pointed out that it was not possible to take a 9 a. m. sample of the raw sewage and a sample of the effluent at the same time and expect to obtain any correlation of the analyses. In collecting samples the use to which they will be put should be known. This is particularly true if any preservative is required. The speaker also gave some pointers on the matter of taking wet sludge samples and samples of filter cake. For trade wastes, the type of waste must enter into the considerations given to sampling.

In the discussion of this paper, C. C. Hommon, of Canton, emphasized the inapplicability of results obtained from grab samples and inquired as to the frequency of sampling necessary to good results if it were not possible to sample around the clock. Mr. McGuire suggested five samples taken during the day.

Dr. George E. Symons, of New York, elaborated on some of the

Programmers and Headliners

F. Holman Waring, Chief, San. Engr. Div., Ohio Dept. Health

W. Homer Wisely, Exec. Secy., Sewage Wks Fed., Urbana, Ill.

A. M. Rawn, Chief Consultant, Sewage Sec., WPB, Washington*

Lt.Col.B.F.Hatch, U. S. Engrs., 5th Service Command, Ohio

*(*Chief Engr. and Gen. Mgr., County Sanitation District, Los Angeles, and Editorial Associate, "Water Works and Sewerage")*

Programmers—Morning

Left: C. D. McGuire (Columbus) and Geo. E. Flowers (Cleveland). Right: T. C. Schaetzle (Akron) and Jim R. Collier (Elyria)

(All being treatment works superintendents)

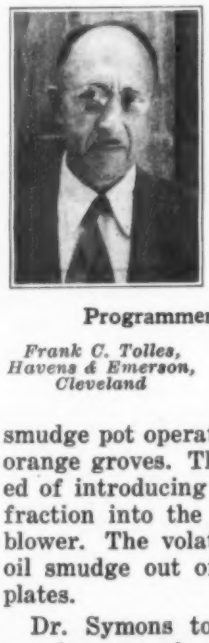
problems presented by Mr. McGuire, stating that chlorine demand cannot be determined on composite samples. The same is true of bacteria. Storage above 4 deg. C. causes changes in B.O.D. and flocculation of suspended solids is noted after standing even at low temperatures.

Continuous and automatic sampling gives the most representative samples but storage is an important factor, as is the cleanliness of the sampler. The problem of proportional sampling of the larger particles is not solved. If grab samples are to be used, they should be so spaced in the plant that they will be representative of the flow time through the various processes. The best way to use grab samples is to run hourly analyses for a period of a week and pick the hour of the day which most nearly represents the average. Otherwise the best time for grab sampling is the time of peak load and flow, with samples taken through the plant at the respective flow times.

Activated Sludge

Under the leadership of J. R. Collier, Supt. of Treatment at Elyria, activated sludge was discussed. Mr. Schaetzle of Akron wanted to know if the foam observed in the Guggenheim Process at the Cuyahoga plant was caused by lack of dissolved oxygen. According to C. D. Decker of Bryan, foam is not related to oxygen content where mechanical aerators are used. W. H. Wisely, Engr. Mgr., Urbana-Champaign Sanitary District, said that in his observations foam was usually associated with the presence of oxygen. Linn H. Enslow, Editor, *Water Works and Sewerage*, differentiated between "foam and suds," saying that the former occurred with good oxidation and the latter occurred with oxidation deficiencies. In this regard the nose was perhaps the best indicator in determining what was healthy foam and what was sickly suds. A woody odor accompanied healthy foam, and something of a horse stall smell (from the "south end") went along with the sudsy condition.

Mr. Collier then told of experiences in aeration plate plugging with consequent buildup of back pressure. Blow torch spalling of the plate surface had been resorted to, but was effective for only about two weeks before pressures began to increase. A. M. Rawn explained that the method he had once reported on was a dry cleaning process to remove the oil smudge which came from the



Programmers—Afternoon

Frank C. Tolles, Havens & Emerson, Cleveland — *W.E.Gerdel,Supt., Westerly Plant, Cleveland*

smudge pot operations to protect the orange groves. This method consisted of introducing a volatile gasoline fraction into the suction of the air blower. The volatile oil cleaned the oil smudge out of the pores of the plates.

Dr. Symons told of experiments on the use of chlorine introduced into the air line to remove organic growths at the Buffalo, N. Y., sewage treatment works. Back pressures had built up from 4 p.s.i. to 6 p.s.i. because of the growth of a sewage organism on the surface of the plates. Addition of chlorine gas to the air line for a period of about eight hours caused the growth to slough off and the porosity of the plates was increased to a point where the back pressure was reduced to 4.4 p.s.i. Linn H. Enslow remarked that the use of chlorine was effective only on organic growths and that it would not affect a cleaning of plates stopped up with an inorganic deposition. However, much clogging being due to organic blockages, the intermittent chlorine applications had been effective as a simple method of postponing a more costly mechanical or acid bath cleaning of diffuse media.

Sludge Handling and Disposal

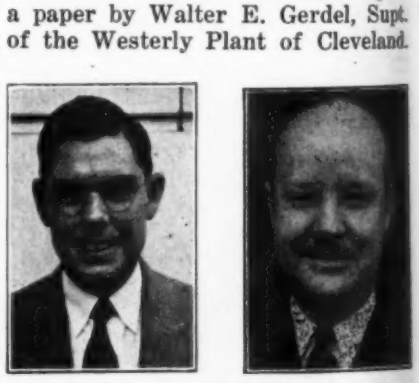
G. E. Flower, Supt. of the Southerly Sewage Treatment Plant of Cleveland, told the group of the problems of handling sludge. Activated sludge from the Easterly plant in Cleveland is pumped 13 miles to the Southerly plant. This sludge is of low solids content. Rags tend to ball up and cause difficulties in the line. Because of the dilute sludge the quantity of supernatant liquor from the digesters presents a problem.

Experimental work on the development of a system of aeration followed by low vacuum was discussed, but there appeared to be no definite data on the effectiveness of this method for use in supernatant liquor. Major F. W. Jones reminded the audience that where digestion tank space is limited, a good lagoon is a definite asset.

Mr. Leatherman, of Van Wert, asked whether continuous addition of sludge and removal of supernatant liquor was better than intermittent pumping. Mr. Leatherman also wanted to know how much space should be allotted to the supernatant liquor and how much to the digestion compartment, and he further raised the question as to the possibility that the potential and hence possible cathodic corrosion, was greater or less in the sludge layer than in the supernatant layer. Unfortunately there was not sufficient time for answers to Mr. Leatherman's questions.

Plant Operation and Coordination

The "Problems of Plant Operation and Coordination" were taken up in a paper by Walter E. Gerdel, Supt. of the Westerly Plant of Cleveland.



Programmers—Night

Linn H. Enslow, Editor — *George E. Symons, Assoc. Editor*

"Water Works & Sewerage"

W. E. Ryan, Chief Operator, and K. L. Ewart, Supt., Wat. Wks. & Sewerage, Cuyahoga Falls, O.

C. A. Starr, Plant Operator, and Fred Howard, Service Director, Wooster, O.

Oliver Sutter, Chief Operator, Camp Perry, O.

L. E. Barnes, Supt. Sewerage, Bowling Green, O.

W. F. Crohen, Sanitary Engr., Camp Perry, O.

Harold A. Fitch, Act'g Sanitary Engr., Lake County, and Oliver Sirola, Asst. Sanitary Engr., Lake County, Painesville, O.

Earl V. Ackerman, Supt. of Treatment, Bucyrus, O., and W. H. Jacobs, Chief Operator, Lima, O.

Mr. Gerdel described the Westerly plant briefly.

Among the several problems brought on by the war are those of personnel and supplies. At the present this plant has no technically trained supervisors or chemists who were in the plant in 1938 and no technically trained supervisors at all. The result has been a lowering of efficiency. Supplies are not forthcoming and it has been necessary to "get along" with repairs or salvage materials.

Grit has increased with the increased flow of the last few years. It is being jetted with water to remove it from the pump sumps. Digestion, some of which is still carried on in the old Imhoff tanks, is not satisfactory. Scum formations which apparently used to become stabilized at about a certain thickness, now continues to build up and has broken the heating coils. This scum also insulates the digestion compartment, and prevents proper takeoff of supernatant liquor. Recirculation has not been of any value.

Other problems at this plant include that of post chlorination at least 100 days a year. In this connection Mr. Gerdel said there was a definite need for the development of an automatic chlorination control; one which is accurate and has a definitely good stamina.

One very interesting new practice at the Westerly plant is the use of Saran plastic for strings on the string filter. If any breaks occur, the strings are welded with a little heat.

Sewerage Priorities

A. M. Rawn, Chief Sewage Consultant to the Governmental Division of the War Production Board, told of the progress being made toward the clarification of the priority situation in regards to sewerage and sewage treatment. In the new order (published July 5 and reproduced in the July issue of WATER WORKS & SEWERAGE) sewerage priorities are removed from the utility field and one form is sufficient to cover all types of requests for materials. Mr. Rawn has prepared a pamphlet explaining the new order and this is to be mailed to all members of the Federation of Sewage Works Associations.

A Consulting Engineer's View

With straight face and dry wit, Mr. F. C. Tolles, of Havens and Emerson of Cleveland, presented some observations on sewage treatment plant operation as it should and should not be done. Written in the language of a layman making an appraisal, the paper called attention to raked and unraked screens, pumps with and without leaking packing rings, pump rooms located "too close to the pump operator's boudoir." Other phases of good and bad operation were also noted, as for example, junk in the operator's room, tanks covered with scum, trickling filters with spray heads which can be made to form all sorts of spray designs by "the insertion of a piece of match stick."

In the future it may be expected that there will be more general financing of sewage plant operation by sewer rentals, according to Mr. Tolles, who believes that plans should be made for the future with the expectation of increased performance of equipment.

State Dept. of Health Planning

F. H. Waring, Chief Engineer of the Ohio State Dept. of Health, gave an enlightening talk on "Present and Post-War Planning of the State Dept. of Health." Whereas, three years ago the department had 12 sanitary engineers it now has but four, and three of these are replacements. Under these conditions it is impossible to do the work of inspection and guidance formerly carried out. Mr. Waring hopes to recreate the department after the war and expand the district engineers of whom he now has seven.

Regarding post-war planning, Mr. Waring says that we need plans but not the type that existed in 1933-34. Plans are needed for definite improvements; plans looking toward the introduction of secondary treatment in many places; plans for cities such as Cincinnati and others whose wastes affect the Ohio River Valley; plans that may be considered good business to have ready for the immediate post war period when there will be a severe upheaval of economy and job relocation.

For the present additional sewage works construction is out, unless it can be shown that the same money spent on a downstream water plant will not produce the same, or better, results.

Sewage Treatment at Military Installations

Lt. Col. B. F. Hatch, Corps of Engrs. 5th Service Command, reviewed the sewage treatment pro-

(1) *Wendell R. La Due, Supt. & Chief Engr., Bureau of Water and Sewage, Akron*

(2) *Harvey P. Jones, Cons. Engineer, Toledo*

(3) *M. W. Tatlock, Supt. of Treatment, Dayton*

(4) *W. L. Leatherman (Van Wert, O.), Supervisor, Hicksville Plant*

(5) *J. H. Wenger, Superintendent, Westerville, O.*

gram of the army at the beginning of the camp construction plans, and gave some of the bases of design, and the capacity factors used for different sizes and types of plants.

One of the worst problems is that of grease which can be overcome to some extent by proper cleaning of traps. Laundry wastes are another problem which is accentuated by the overload. There are manpower problems too because operators of army plants (almost wholly civilians) are often subject to the draft.

Col. Hatch said that designs must be made to allow for the maximum flexibility of population load. Mechanical contrivances should be simple because the operators available may not be skilled. Col. Hatch also said that he expected that Army experiences in sewage treatment would lead to a good post-war effect because of the attitude of the government toward the need for sanitation and also because the "boys will know what sewage treatment is" and will want to see that "the home town" has the best.

The Sewage Federation Wartime Plans

W. H. Wisely, Exec. Secy. of the Federation of Sewage Works Associations, told the conference that the Federation was more than a "journal publishing organization" and pointed to the work of the Federation in making known the needs of the sewage field in the matter of priorities, and the help the Federation had rendered in the matter of securing a Sewerage Section in the W.P.B. and the appointment of Mr. Rawn to head up the new section.

According to Wisely the reluctance to discuss post-war planning is disappearing and through the Federation, the AWWA, the NEWWA, and the Water and Sewage Works Manufacturer's Association, a committee (with money) has been set up to study post-war planning.

In regard to the manpower problem, Wisely said that the Federation had been helpful in drawing up the occupational standards for deferment. Wartime meetings of the Federation have been adjudged valuable to the members and the profession at large. The next meeting will be held in Chicago on October 21-23.

Miscellaneous activities of the Federation include the preparations of the manuals of practice in regard to sewage sludge, aeration plates, and sewer maintenance.

Mr. Wisely commented briefly on the matter of a twelve versus a six issue journal and stated that twelve issues would not increase the text space to any appreciable degree. Wisely concluded, saying that the Federation membership is increasing, its work is increasing, and its service is increasing.

Sewage Treatment Processes and Results

The annual conference dinner held at the hotel was addressed by Linn H. Enslow, Editor, and Dr. George E. Symons, Associate Editor, of *Water Works and Sewerage*, Dr. Symons spoke first on the subject of "Sewage Treatment Processes and Results," and pointed out that there are only three processes of sewage treatment: Primary treatment, Secondary treatment, and Disinfection, with solids disposal as a by-product process. All other so-called processes are variations of, or aids to these basic processes.

Primary treatment is the removal of suspended matter by physical and mechanical means. Aids to this process include flocculation, vacuation, chemical precipitation grease removal by air, or air and chlorine, and mechanical equipment for aiding in the removal of solids.

Secondary treatment is an oxidation or wet burning process which may be accomplished by either trickling filters or activated sludge. Aids to the trickling filter method are the high rate filters, and preaeration. Aids or improvements in the activated sludge process include the planned addition of chemicals, (Guggenheim) tapered aeration or distributed input, two stage contact aeration (Hayes process) and the Oxidized sludge process (Mallory process).

Disinfection signifies the destruction of pathogenic or disease producing organisms, not complete sterilization. It is commonly practiced with chlorine or chlorine compounds.

With this outline Dr. Symons proceeded to list and compare some of the results obtainable by these different methods of carrying out the three main sewage treatment processes. As bases for comparing the removal of solids in primary treatment methods it was pointed out that the use of the *settleable* solids by weight test was more applicable to such comparisons than the use of the suspended solids test. Disinfection practice and results were presented with the comment that the determination of the per cent kill was misleading and that the number of bacteria remaining after disinfection is the important factor.

In summarizing, Dr. Symons said that the choice of sewage treatment processes or method should depend on the extent of the treatment needed or desired, and the best results obtainable from various combinations of these methods at the lowest possible cost for installation and for operation.

Evaluation of Sanitary Engineers by W.M.C.

Mr. Enslow spoke on the evaluation of sanitary engineers and essential personnel of water supply and sewage treatment plants, in the light of the recent War Manpower Commission rulings regarding the number of key operating engineers or chemists considered as essential for municipal plants of various sizes. The operating head of the water and sewage works have the privilege of naming the permissible men who will thereafter be considered exempt from the Selective Service Act.

W. H. Wisely, Supt., Sew. Treatment Wks., Champaign-Urbana, Ill., and F. Woodbury Jones, Major, U.S.P.H.S., Cleveland

D. P. Griffin, District Engr., Mansfield, O., and S. M. Stine, District Engr., Canton, O.

V. R. Schick, Supt., Treatment Wks., Van Wert, Ohio, and Lester F. Cole, Plant Operator, Van Wert, Ohio

A. M. Rawn, Chief, Sewerage Sec., Govt. Div., W.P.B., and W. R. La Due, Supt., Water and Sewerage, Akron

F. P. Fischer, Mgr., Cleveland District, Wallace & Tiernan Co., and J. A. Nicklis, W. & T. Dist. Engr., Columbus, Ohio

THE MATHEMATICS OF B.O.D. DETERMINATIONS

By H. M. GIFFT
Asst. Prof. of Civil Engineering
CORNELL UNIVERSITY
ITHACA, N. Y.

THE biological and chemical problems in connection with the B.O.D. test have been studied for many years. The detailed procedure for the necessary D.O. determinations has been relatively well established for some time. Valuable contributions have recently been made towards a standard dilution water which will be satisfactory for all types of wastes. There is still, however, a great divergence of opinion regarding proper dilutions to be made and the method of making the relatively simple arithmetical computations.

Most authors specify at least two methods for making the dilutions and calculating the results, depending on whether the sample is "weak" or "strong." These procedures will generally fall into one or more of the following categories:

1. Too many dilutions and subsequent D.O. determinations.
2. Complicated calculations.
3. Approximate results or, under certain conditions, results seriously in error.
4. Seeding when necessary, may be either impractical or may cause appreciable errors in the results.
5. Measurement of only part or none of any immediate oxygen demand.

Examples of B.O.D. Equations

The average analyst, being unfamiliar with the algebra involved or having failed to properly study the procedure being used, often will not recognize the inapplicability of certain methods to the particular cases where serious errors might result.

For example, one well known book specifies an approximate calculation for dilutions containing less than five per cent of the sample. This calculation is expressed as an equation as follows:

$$\text{B.O.D.} = \frac{W_2 - D_2}{P} \qquad \text{(Eq. 1)}$$

Wherein W_2 = D.O. in incubated diluting water (blank).
D_2 = D.O. in incubated dilution (sample).
P = decimal proportion of sample in dilution.

The calculated result is in error by the difference between the final

The Author

D.O. of the diluting water and the original D.O. of the sample. When the sample is practically devoid of oxygen, as is often the case, such an error becomes serious only when the B.O.D. is in the low range. An error of 14 per cent is possible.

For dilutions containing more than five per cent of the sample, the same author specifies duplicate D.O. determinations for each percentage dilution chosen, as well as for the diluting water blank.

In equation form this calculation is:

$$\text{B.O.D.} = \frac{D_1 - D_2 - (W_1 - W_2)}{P} \qquad \text{(Eq. 2)}$$

(In which W = D.O. of the blank, D = D.O. of the sample, P = proportion of sample in dilution and the subscripts 1 and 2 refer to "before" and "after" incubation, respectively.)

If the sample should have an immediate oxygen demand, a portion of this demand would not be measured if there were any delay in making the original D.O. determination on the dilution. Fortunately, such an error is seldom serious since the "weaker" wastes ordinarily have little, if any, immediate demand.

On the other hand, the calculated results are also in error by the amount of B.O.D. of the diluting water. If seed is added to the diluting water, the effect on the determination of a low B.O.D. might be appreciable. Besides being in error on these two counts, this method requires the determination of D.O. in each dilution both before and after the incubation period. This procedure admits of possible error if the sodium thiosulfate solution strength changes during the incubation period. A change of 1 per cent may cause an error in results of as much as 5 per cent.

In another well known book, three different methods for calculating B.O.D. are given. The first method, giving approximate results, is to be used "under ordinary circumstances when the B.O.D. of the diluting water is not great." This equation is:

$$\text{B.O.D.} = \frac{D_1 - D_2}{P} \qquad \text{(Eq. 3)}$$

(Wherein D_1, D_2, and P have the same meaning as in equations 1 and 2.)

It can be seen that any B.O.D. of the diluting water is included in the apparent B.O.D. and is multiplied by the dilution factor. Also, as in Eq. (2), any immediate demand of the sample may not be completely measured, and as in Eq. (1), the results are in error by the difference between the original D.O. of the sample and the final D.O. of the diluting water. In this case the B.O.D. of the diluting water is most serious when P is small. The other two errors are of greatest importance when P is relatively large.

The same author proposes a second method of calculation to be used when extreme accuracy is required, as follows, "First, the difference between the dissolved oxygen, in parts per million, in the unincubated dilution water and in the incubated dilution water is multiplied by the proportion of the dilution water contained in the diluted sample; and this product is added to the amount of dissolved oxygen, in parts per million, in the incubated diluted sample. Then, the sum is subtracted from the amount of dissolved oxygen, in parts per million, in the freshly-diluted sample. Finally, this difference is divided by the proportion of original sample in the diluted sample."

As an equation this calculation becomes:

$$\text{B.O.D.} = \frac{D_1 - (W_1 - W_2)(1 - P) + D_2}{P} \qquad \text{(Eq. 4)}$$

(Wherein the letters and subscripts have the same meaning as in equations 1, 2 and 3.)

Besides being a rather formidable looking equation, this method also requires the determination of D.O. in each dilution both before and after incubation. Whenever the actual original D.O. of a dilution is used in the calculations, any imme-

diate oxygen demand will cause an error in results.

The same author goes on to state that the D.O. of the fresh diluting water need not be used in the calculations for the B.O.D. of oxidized effluents. "The proportion of dilution water in the diluted sample, expressed as a decimal, is multiplied by the number of parts per million of dissolved oxygen in the incubated sample of dilution water; the proportion of original undiluted sample in the diluted sample, expressed as a decimal, is multiplied by the number of parts per million of dissolved oxygen in the original undiluted sample; and the two products are added. This sum represents the total dissolved oxygen available for depletion by the original sample. Then, the dissolved oxygen in the diluted sample after incubation is subtracted from the total available dissolved oxygen just found, and the difference is divided by the proportion of original sample in the diluted sample." This calculation is expressed by the equation

$$\text{B.O.D.} = \frac{W_2 (1 - P) + S_1 (P) - D_2}{P} \quad \text{(Eq. 5)}$$

(Wherein S_1 = D.O. in undiluted sample, and other letters are the same as in the previous equations.)

This equation is both mathematically and practically correct but includes two needless multiplications and there is no explanation of why the method should be limited to oxidized effluents.

In order to simplify the calculations for the B.O.D. of strong wastes practically devoid of oxygen, the suggestion is made to ignore the term $S_1 \times P$. In such cases the resulting error, always in the same direction, will be equal to the actual D.O. of the undiluted sample. In order to eliminate one multiplication there may be a tendency to ignore this term even though some D.O. may be present in the sample. Such an error could be serious only when the B.O.D. is relatively low. Without question the "Standard Methods" procedure offers the least likelihood of incorrect results, inasmuch as it contains only one mathematically and practically correct equation similar to Eq. (5).

Except to simplify the calculations, to correct for the B.O.D. of the diluting water, or to correct for the D.O. in the undiluted sample, there appears to be little reason for alternate methods either for making dilutions or calculating results. Certainly the fewer D.O. determinations the better. Also, in order to keep errors caused by technique at a minimum, it is desirable to make all D.O. determinations at one time. For mathematically correct results it is not possible to do this.

Proposed Equation

By proper algebraic manipulation of the "Standard Methods" equation, all multiplications may be eliminated, and the D.O. of the undiluted sample included in such a form that actual estimations may be made without causing appreciable errors or complicating the calculations. The following equation has been developed to serve the purpose:

$$\text{B.O.D.} = \frac{W_2 - D_2}{P} + S_1 - W_2 \quad \text{(Eq. 6)}$$

Wherein W_2 = D.O. in incubated diluting water (blank).
D_2 = D.O. in incubated dilution (sample).
P = Decimal proportion of sample in the dilution.
S_1 = D.O. in undiluted sample.

Substitution of observed data in this formula produces the correct results free from interfering errors.

When two or more dilutions are made the D.O. of the blank may be eliminated from the calculation, if desired, by using the differences in the final D.O. after incubation of any two dilutions and the differences in the decimal proportions of the same dilutions. For such calculations the above equation takes the general form:

$$\text{B.O.D.} = \frac{\text{Difference between D.O. of any two dilutions}}{\text{Proportion difference, same two dilutions}} + S_1 - W_2 \quad \text{(Eq. 7)}$$

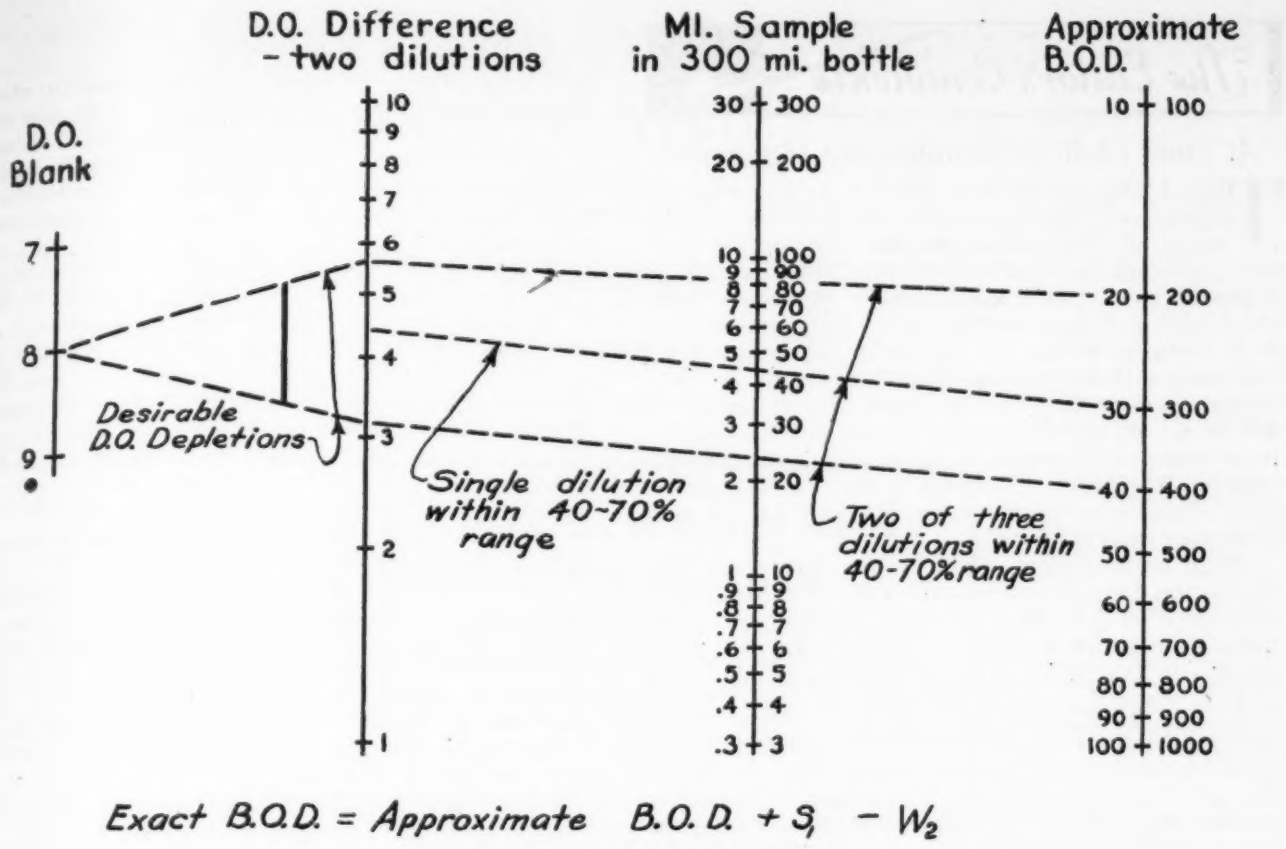
The equation in this form, either Eq. 6 or its corollary Eq. 7, has several advantages, both for treatment plant records and control, or for original investigations and research.

1. The number of required dilutions and D.O. determinations is a minimum. Even in cases where extreme accuracy is required, only one D.O. determination is necessary prior to the incubation period.
2. Even for exact results, the calculations are of the simplest form.
3. Under ordinary circumstances the original D.O. of the sample may be estimated. Providing the sample has no immediate oxygen demand and for approximate results it may even be desirable to aerate the sample until the D.O. content approaches that of the diluting water, in which case, the two correction factors cancel.
4. When seeding is necessary, no complications are introduced. If equal quantities of seed are added to each bottle, the B.O.D. of the seed does not influence the calculations; the last term being the D.O. of the diluting water without seed. If the seed is added to the diluting water first, then the last term is, of course, the D.O. of the seeded diluting water.
5. Any immediate oxygen demand of the sample is completely measured.
6. The B.O.D. of the diluting water does not influence the results. Except for the reduced range of oxygen depletions, the B.O.D. of the diluting water is of little consequence.
7. Any difference between the quality of the D.O. test reagents before and after the incubation period are not exaggerated by the dilution factor. Under usual laboratory conditions this would not be important. However, sometimes, such as in field testing or in stream pollution work, the strength of the sodium thiosulfate solution is not always controlled as it should be.
8. Probably the greatest advantages lie in its satisfactory application to all types, strengths and condition of waste or polluted waters and the straightforward manner of taking into account the original D.O. of the undiluted sample. It should be obvious to most any analyst whether to ignore, estimate or actually measure this one variable.

Chart for Simplification Of Calculations

The first part of the equation readily lends itself to solution by charts, graphs or tables. It is a simple matter to perform the necessary additions and subtractions mentally when conditions require it. Such a calculator, of the alignment chart form, shown in the accompanying figure, has been very convenient in our laboratory practice not only for the B.O.D. calculations, but particularly for making the proper dilutions. Since 300 ml. dilution bottles were used at all times and the sample was added directly to the bottle, the actual quantity of sample was included in place of percentage values.

The use of the chart for B.O.D. calculations is relatively simple. A straight-edge is lined between the D.O. difference and the amount of sample in the dilution and the B.O.D. is read directly. The corrections, when necessary, are made by simple


D.O. Difference - two dilutions
Ml. Sample in 300 ml. bottle
Approximate B.O.D.
D.O. Blank
Desirable D.O. Depletions
Single dilution within 40-70% range
Two of three dilutions within 40-70% range
Exact B.O.D. = Approximate B.O.D. + S1 - W2

Alignment Chart for B.O.D. Calculations

additions and subtractions. The desirable 40-70 per cent range of oxygen depletions may be checked by eye.

Estimating dilutions is approximately the reverse of B.O.D. calculations. A straight-edge may be lined between the midpoint of the acceptable range of oxygen depletions to the estimated B.O.D. The intersection on the "quantity of sample" line indicated the required single dilution. For more than one dilution, the possible range of the B.O.D. is estimated and the alignments made between the extreme values of D.O. difference and the comparable extremities of the estimated B.O.D. range. A similar chart may be made where different size bottles are used or where dilutions are set up by percentages.

Robert Spurr Weston Passes in His 74th Year

Robert Spurr Weston, a distinguished and much beloved pioneer in sanitary engineering, died on July 28th at his home in Brookline, Mass., the victim of heart attack. Had he lived until August 1st he would have been 74 years old.

R. S. Weston

Mr. Weston, of Colonial New England ancestry, was born in Concord, N. H. He was graduated by Amherst College in 1891, after which he pursued his studies at the Mass. Inst. of Technology and later in the Univ. of Berlin. His first job was that of assistant chemist on the famous filtration studies at Louisville, Ky., with George W. Fuller, J. W. Ellins, Geo. A. Johnson—all becoming well known in the sanitary engineering profession thereafter. Of this group Ellins, of Cleveland, is now the sole survivor.

In 1899 Mr. Weston established a private practice as consulting chemist and engineer in Boston. In 1912 George A. Sampson joined him to form the firm of Weston and Sampson of Boston. During his career he became a contributor of many worthy technical papers to the literature and was co-author of the widely known "Water Works Handbook" by Flynn, Weston and Bogert.

Mr. Weston was an early advocate of water chlorination and the first to establish the value of prechlorination of colored surface waters as an aid in coagulation and filtration. For his studies of corrosion and lead poisoning, he was awarded the Dexter Brackett Medal of the New England Water Works Assn., which later made him an honorary member.

Mr. Weston was an honorary member of the Am. Water Works Assn. He was a past president of the Boston Soc. of Engrs. and past vice-president of the Am. Inst. of Consulting Engrs. In the Am. Soc. of Civil Engrs. he was a past chairman of its Sanitary Eng. Div. He was a member of the Am. Inst. of Chemical Engrs., the Am. Chemical Soc., the Am. Public Health Assn., and the New England Sewage Wks. Assn.

He was a member of the Delta Kappa Epsilon fraternity, the Engineers' Club of N. Y. and the City Club of Boston. He was a past president of the Boston Chapter.

Amongst his many sterling qualities Mr. Weston was a friend of the small water works operator, considerate, kind and helpful at every opportunity. The profession has lost a distinguished and highly esteemed member.

The Editor's Comments

A Time Limit to Maintenance Deferment

THE TIME has arrived when it is important to concentrate on catching-up on deferred maintenance of water works systems. To further delay this work will be improvident and, worse, is apt to jeopardize the safety or dependability of those systems which have not been receiving such maintenance work as is normally given. In this direction we are much impressed with the message prepared recently by Lloyd Nelson as Secretary of the Four States Section of A.W.W.A., for distribution to members of the Section. In as much as this message comes indirectly from the Office of War Utilities, because of Mr. Nelson's service in its Water Supply Branch, we are devoting this page to quoting excerpts from it.

"Each water utility should by now have received a copy of the Administrative Letter OWU-6 dated June 23 and signed by J. A. Krug, Director, Office of War Utilities. One sentence reads: *'It is sound policy for utilities to plan for a long war and to maintain equipment in good operating condition at all times'.* Reference to the table of withdrawals for use from water works inventory on page 541 of the April Journal of the A.W.W.A. shows that on the average water utilities are not maintaining their plant even to the restricted extent permitted by Order U-1—in fact to less than half the amount allowed—and much less in the case of transmission and distribution class material."

"While delaying maintenance last year was helpful to the war effort, this year the opposite is true. The types of material water works use for maintenance and repair are now readily available, since the war facilities construction program is practically completed. This is particularly so in the case of transmission and distribution material, and a wise use of such materials in minor extensions (under $1500 worth of material in underground individual jobs) in strengthening the piping gridiron, tying in dead ends, etc., which are permitted under U-1 without special approval, will reduce pressure losses, save fuel and power, and ease the load on still critical pumping equipment."

"The same letter referred to above also states that by July 1, 1943 the water utilities requirements for construction projects needed by the end of 1944 must be reported. This was true, but there is an opportunity for the Water Division to revise its estimates for each future quarter of a year on the first day of each calendar quarter. Therefore, on October 1, 1943, new estimates will be submitted on requirements."

"As stated by both Mr. Krug and Mr. Gorman at the Cleveland A.W.W.A. Conference last month—what will your situation be in the event of a drought? You should have your plans underway now for essential construction you will need within the next year, and apply for priority assistance on form WPB-2774 as soon as possible. If you cannot get your application into Washington by October 1st, then write the Water Division of OWU before that date, giving all possible information as to your requirements."

"The Army Navy Munitions Board 'List of Prohibited Items for Construction Work' was amended May 19, 1943, and on June 26, 1943, based on the revised list, there was issued the 'Critical Construction Materials Design Guide' by the War Production Board. You can secure a copy of this from your nearest WPB office. It will be helpful in connection with materials which you can secure for essential projects, but it does not give details as to the relative availability of various types of equipment. At present, in general, the relatively simple, manually operated types of equipment are more easily secured than automatic, or hydraullically operated types."

"State Water Coordinators are now entirely divorced from the Inventory Redistribution program of the WPB. The Coordinators will probably soon call on each water utility for a new up-to-date complete inventory of materials, equipment, and manpower, for confidential records for use only in the event of a major disaster. Under these conditions, they deserve your full cooperation. But do not forget to notify the Regional Office to remove from their records of your excess inventory, material no longer considered in excess, due to amendments of Order U-1, or your use or sale of material from your excess inventory."

"The longer the war lasts, and the higher our federal debt soars, the less likelihood there is of a federal aid system of loans or grants for municipal public works after the war. If there is such a program, those who have their plans and specifications ready, their land purchased or rights of way arranged, have their share of the financing available, etc., will receive first call on whatever help is available. If there is no federal aid available, water utilities will still need the same plans, specifications, etc., to catch up with the great backlog of needed improvements necessarily neglected during the defense and war periods."

Therefore, get your "post war planning" underway.

There are rumors as to the present schedule for ending the war ranging from February 1944 in Europe and October 1944 in Asia, to late in 1945 for Europe and late 1946 for Asia. While we all hope the shorter dates are correct, it is still good advice to plan our operations on the basis of a long war period still to come.

England has practically completed the manufacture of equipment for her ground forces, and the United States will do so within a year. Planes and ships will continue in demand for the duration, however.

It is apparent from what has recently been said by Messrs. Krug, Gorman and Nelson of the Office of War Utilities that there is a danger in any further deferment of normal water works maintenance. Also that water works managers are urged and expected to take stock of anticipated needs in strengthening existing systems against weakness and possible failure ,in order to avert emergencies or serious shortages in water supply. It is important that the OWU be notified of such anticipated needs as early as permissible, so that under the Controlled Materials Plan the proper allocation of materials to the water supply industry can be arranged in advance (as required) of the time when purchase orders are to be placed.

In brief, there is a decided feeling down in Washington that water works managers have long enough deferred normal maintenance work because of patriotic motives; and, since there is no longer the need for continuing to adhere to the "patch and pray" policy and program, earlier advocated, there is no sound reason to continue such. In fact, there is some concern over the possibility of a crippled water supply service in this country if the system strengthening is not looked to now.

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PLAN TO ATTEND THE . . .

New England Water Works Association, Boston, September 28-29.

Federation of Sewage Works Associations, Chicago, October 21-23.

Southwest Section, American Water Works Association, Oklahoma City, October 11-13.

California Section, American Water Works Association, Los Angeles, October 27-29.

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MEETINGS SCHEDULED:

Sept. 15-16—MITCHELL, S. DAK.
South Dakota Water and Sewage Works Conference. Sec'y-Treas., B. A. Nangle, Pierre, South Dakota.

Sept. 16-17—DENVER, COLO. (Hotel Cosmopolitan).
Rocky Mountain Section, A.W.W.A. Secretary, O. J. Ripple, Supt. Filtration, Littleton, Colo.

Sept. 22-23—PITTSBURGH, PA. (Roosevelt Hotel).
(Joint Wartime Conference)
Western Pennsylvania Water Works Operators Association.
Western Pennsylvania Section A.W.W.A. Secretary, Earle P. Johnson, Wallace & Tiernan Co., 418 Flannery Bldg., Pittsburgh, Pa.

Sept. 22—BOSTON, MASS. (Hotel Parker House).
New England Sewage Works Association. (Fall Meeting). Secy.-Treas., LeRoy W. Van Kleeck, State Department of Health, Hartford, Conn.

Sept. 28-29—BOSTON, MASS. (Hotel Statler).
New England Water Works Association. (Annual Convention.) Secretary, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Sept. 30-Oct. 1—BINGHAMTON, N. Y. (Arlington Hotel).
New York Section A.W.WA. Fall War Conference. Sec'y-Treas., R. K. Blanchard, 50 West 50th Street, New York City.

Oct. 5-7—GRAND FORKS, N. D. (Ryan Hotel).
North Dakota Water & Sewage Works Conference. (15th Annual Convention). Sec'y-Treas., K. C. Lauster, Bismarck, N. D.

Oct. 11-13—OKLAHOMA CITY, OKLA. (Hotel Biltmore).
Southwest Section, A.W.W.A. Secretary, Geo. J. Rohan, Supt., Water Works Municipal Bldg., Waco, Texas.

Oct. 12-14—NEW YORK, N. Y. (Hotel Pennsylvania).
American Public Health Wartime Conference. Executive Secretary, Dr. Reginald M. Atwater, 1790 Broadway, New York, N. Y.

Oct. 14-16—PHILADELPHIA, PA. (Benjamin Franklin Hotel)
Four States Section A.W.W.A., New Jersey Section A.W.W.A. and Pennsylvania Water Works Operators Ass'n. (Combined Meeting.) Sec'y, 4-States Sect., H. Lloyd Nelson, 1624 Lincoln Liberty Bldg., Philadelphia (7) Pa.; Sec'y, N. J. Sect., C. B. Tygert, Box 172, Newark, N. J.; Sec'y, Pennsylvania W. W. Oper. Ass'n., I. M. Glace, 22 S. 22nd St., Harrisburg, Pa.

Oct. 15-16—DES MOINES, IOWA (Hotel Fort Des Moines).
Missouri Valley Section, A.W.W.A. Secretary, Earl L. Waterman, Prof. of Sanitary Engineering, University of Iowa, 104 Engineering Hall, Iowa City, Ia.

Oct. 19-21—MILWAUKEE, WISC. (Plankinton Hotel).
Wisconsin Section A.W.W.A. Secretary, L. A. Smith, Superintendent Water Works, City Hall, Madison, Wis.

Oct. 21-23—CHICAGO, ILL. (Hotel Sherman).
Federation of Sewage Works Association. Annual Meeting, "War Time Conference." Secretary, H. W. Wisely, Urbana-Champaign Sanitary District, Urbana, Ill.

(*Continued on page* 83)

DO YOUR CITY STREETS HAVE "TELL-TALE" PATCHES?

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*Here and There with "Doc" Symons**

"Doc."

HERE and now we join the campaign to stop the practice of nonregistration of some persons at water and sewage works conventions. At several section meetings at which we have been this past spring, there have been a number of non-registrants. At one meeting, even one of the officers didn't register. The registration fee, often nothing, surely isn't more than even the small plant operator can afford. It is unfair to others for persons to attend meetings without bearing their share of the cost of holding such meetings.

* * *

According to the official bulletin of the North Dakota Water and Sewage Works Conference of April, Fargo, N. D., has the following valves for sale to anyone who can furnish the priority: Ten 10-in. Rensselaer hydraulic valves, flange connections; two 16-in. rising stem valves, flange connections.

* * *

From Messrs. Oline and Meyers of the State University of Iowa, by way of "The Chemist Analyst" comes a "Simple Improvement of the Imhoff Cone." These men found in studies on Bentonite as a sewage coagulant that the tips of the cones filled with sludge are difficult to remove. So they cut off the sealed tip and by moderately skillful glass blowing attached a Pyrex 4 mm glass stopcock. To wash out the tip the stopcock was opened, and presto! The system doesn't disturb the accuracy of the Imhoff Cone.

* * *

Well, I guess we all make mistakes. Heard one consulting engineer recently admit that in designing and constructing an office building for a feminine contingent of the army, a row of urinals was put in the toilet on one floor.

* * *

No Little Rollo, "Black" Alum isn't bought on the Black Market, but there was a black day in Baltimore, late in May when Al Brumley of Activated had a nasty motorcycle accident. We heard recently from Bill Ryan of Rochester that Al was recuperating in the mountains and is well on the way to complete recovery. Al will be back in Baltimore soon.

* * *

We read in Time recently that the Government has decreed that the ceremonies for presenting the Army-Navy "E" to plants must be limited to 30 minutes to save production time. Considering the number of awards now being made (over 100 last month) we think the limit a fine idea. But let's give credit to some one who thought of it long before the government did. Up in Niagara

*Associate Editor.

"HERE - READ THIS! IT TELLS WHY I AM USING SUPERSEAL FITTINGS AND TUBE-LOY PIPE ON MY MAIN TO METER HOOK-UPS."
SUPERSEAL Flared Tube-Loy Fittings and ASARCO Type K Tube-Loy for Main to Meter Water Service
SUPERSEAL Flared Tube-Loy Fittings
Made of malleable iron, electro-galvanized.
Long tapered cone provides greater seating area for tubing flare . . . forms a leak-proof joint unaffected by vibration.
Three types available—tube to inside iron pipe thread . . . tube to outside iron pipe thread . . . tube to tube.
Tubing easily flared to SUPERSEAL's 10° angle with wood flaring top and tube holder.
ASARCO Type K Tube-Loy
Tubing extruded from a lead alloy . . . has all of lead's unequalled resistance to corrosion.
Uncoils readily and can be easily bent around obstructions.
Installation requires less effort than heavy walled lead pipe or relatively hard non-ferrous tubing.
Nominal sizes — ½", ¾", 1".
Stock coils — 30', 45', 60', 100'.
BOTH AVAILABLE RIGHT NOW

This combination, made of less critical materials, offers the advantages of easy handling for fast installation, long life, leakproof connections and trouble-free service.

Call your nearby Grinnell Branch for complete information and catalog, or write Grinnell Company, Inc., Executive Offices, Providence, R. I.

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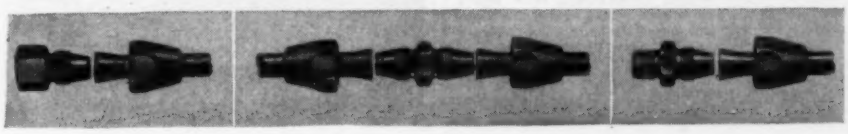

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(HACKENSACK NJ)=
YOU HAVE PERFORMED A SERVICE OF GREAT VALUE TO AMERICAN FIGHTING MEN BY HELPING TO EQUIP SEVERAL RAILWAY BATTALIONS FOR OVERSEAS DUTY WITH THE MATERIALS COVERED BY WAR DEPARTMENT CONTRACT NUMBER W 2789 TC 861 AND TC 985 PREVIOUSLY ACTIVATED RAILWAY BATTALIONS WHICH YOU HELPED TO SUPPLY HAVE BEEN THE BEST EQUIPPED IN THE WORLD THE TRANSPORTATION CORPS BELIEVES THESE LATEST UNITS WILL FARE EVEN BETTER BECAUSE OF YOUR GOOD WORK YOUR PRODUCTION IS A TRIBUTE TO YOUR PATRIOTISM AND YOUR ABILITY=GROSS MAJOR GENERAL CHIEF OF TRANSPORTATION WASHN DC.

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and they also want it right . . . ."

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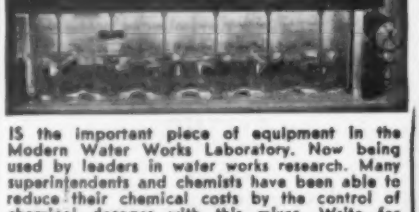
THE *Phipps & Bird*
LABORATORY MIXER . . .



IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.
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ANTHRAFILT
A Filter Medium For All Purposes
ANTHRACITE EQUIPMENT CORP.
101 Park Ave. New York
H. G. Turner Research Engineer
STATE COLLEGE, PA.

Falls, in March, the Mathieson Alkali Works received the "E." The ceremony was held at shift change time, lasted but forty minutes, and scarcely made a ripple in the production. Yes Mr. Government, there are some concerns that don't have to be told how to run a business.

* * *

Just before the AWWA Convention we had a chat with Ed Cleary of Engineering News-Record. As advice to an editorial neophyte, he said to expect occasional errors in printing, makeup, proof reading, particularly in this day of manpower shortage. We needed that advice when we picked up a copy of the June issue of WW&S and saw the colorful Pittsburgh Meter insert ad in backside-up. As an experiment in psychology it was successful, for that ad attracted more comment in that position than had it been properly placed. Advertising Managers please note.

* * *

From an article in the July 7, Dixie Contractor, entitled "Uncle Sam—Water Boy for War-Boom Towns" by Kenneth Markwell, Regional Director of F.W.A., Richmond, comes this: "The new reservoir (for Portsmouth), designed by Greeley and Hansen, consulting engineers of Chicago and Norfolk (and now New York) is an interesting example of the use of groined arches and gravity walls to support the concrete roof which rests on unreinforced concrete columns.

* * *

"This type of construction, developed by early Roman engineers and perfected in the Middle Ages in the construction of Europe's cathedrals, involves intricate engineering calculations, but has been employed successfully in the construction of reservoirs in various cities." . . . Less expensive and saves steel.

* * *

We recently heard a man ask a question as to whether there was any difference in the potential of the supernatant liquor layer and that of the sludge layer. We have observed different pH, alkalinity, and volatile acid content of the two layers, and we hazarded a guess that there would be a difference in potential. A. M. Rawn of California didn't agree. We understand the questioner expects to conduct some experiments to find out the correct answer, but meanwhile we wonder if anyone else has an idea on this interesting question.

* * *

Among the noteworthy items that come to our desk are copies of vari-

ous publications put out by secretaries of sections of A.W.W.A. or Associations in the Federation. One of these spends the two pages explaining why a sewage operator should join the Central States Assoc. but doesn't once mention the local Assoc. bulletin . . . often an inducement in itself.

* * *

From a letter to all members of the 4-States Sections of AWWA comes this paragraph, under the heading "??Prediction??" . . . "There is a definite reaction throughout the U. S. against unnecessary, elaborate bureaucratic control, and rightly so, but . . . now it would be best only to apply pressure for reforms and a gradual lessening of the power of the bureaucracies. Washington is the place where all the big shots and many little people are fighting each other for more personal authority, instead of cooperating in the common effort to win the war. This is primarily true of the regular government employees. The men drafted for special war work are anxious to get it over and leave the utter inefficiency of Washington."

* * *

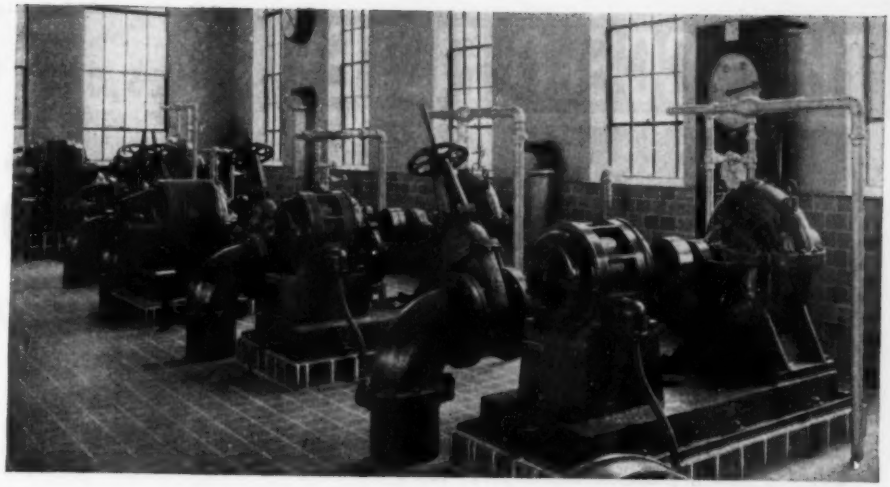
In the July-Aug. issue of "Water Supply and Sewerage News" is a census of the water treatment plants in the State of Washington . . . in case you are interested, write M. S. Campbell, Chief, Div. of Pub. Health Engineering.

* * *

Ann E. Body, Editor of "The Pipe Line" of the New Jersey Section devoted the entire July issue to stories and quips about the Cleveland Convention of AWWA. Including this one; "Tuesday afternoon witnessed a pow-wow on chlorine, for one thing. Marsdon Smith, who presided, drew a big laugh when, after one delegate admitted that he had not detected chlorine in the local aqua pura, Smith said, 'It's a cinch that you haven't taken a shower since you've been here.'"

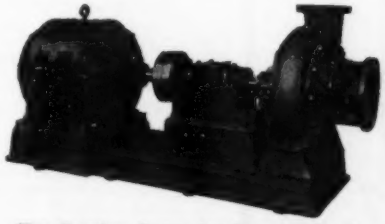
* * *

Writing in the July 10, issue of Chemical and Engineering News, W. D. Collins, of the U. S. Geological Survey, in Washington, tells of "Natural Waters Available for Industrial Use". From the Hetch Hetchy Supply of San Francisco to the colored swamp water on Atlantic Coastal Plain, Mr. Collins tells what and how much mineral salts are dissolved in supplies above and below ground. A map shows the average river water analysis in each state. This is a reference article every sanitary engineer and educator wants in his files.

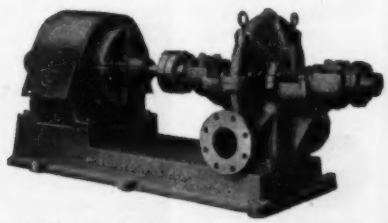


"It may be of interest to you . . ."

So wrote *an old-time customer when telling us that his 40-year old Morris Centrifugal Pump is still in daily service and too good to be replaced. It may interest YOU to know this too, for it indicates the stamina that has always been built into every Morris Pump. Whatever may be your pumping requirements, be sure to investigate Morris Pumps—they will give you high efficiencies and long troublefree service. Bulletins on request.*



Non-clogging Pump for Sewage Service



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On only four tailor-made large-diameter pipe jobs, more than 25,000 tons less iron were used than would have been necessary under other methods of design and manufacture of cast iron pipe. This saving resulted from specifying Mono-Cast Centrifugal Cast Iron Pipe in 16-ft. lengths, made in accordance with the A.S.A. Law of Design. In addition to this important saving in metal, 7,256 fewer joints were required with 16-ft. lengths, resulting in a large saving of labor and material. Three hundred fewer tons of joint materials were needed in making up the joints. Because of the high physical qualities of Mono-Cast Pipe, there was no sacrifice of strength or safety.

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For better results in testing water, sewage, and industrial waste

Just published!
Laboratory Manual for

CHEMICAL AND BACTERIAL ANALYSIS OF WATER AND SEWAGE

By F. R. Theroux, E. F. Eldridge, and W. L. Mallmann
Michigan State College
Third Edition, 273 pages, 6 x 9, $3.00

The new, completely modernized third edition of this practical manual includes clear and concise directions by which even those whose training in chemistry and bacteriology is limited may effectively carry out the analytical procedures used in the investigation of water, sewage, and industrial wastes. Both chemical and bacterial determinations are covered, with newest methods of testing and modern changes in existing methods.

An outstanding feature of this popular manual is the method of presentation of the laboratory procedures in outline form, with definite step-by-step directions.

The manual contains:
—procedures for all the usual tests made in water and sewage plant laboratories as well as many special tests required for stream surveys and trade waste analyses.
—outlined directions for the preparation and standardization of solutions.
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—recommended sampling methods.
—many tables containing conversion factors, etc.

And in the new edition:
—a complete new section on boiler water analysis.
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—quick field test for iron, analysis of salt, centrifuge of sludge, and differentiation of members of the coliform group of bacteria.
—problems with answers for home study.
—field report forms for sample description and bacterial analysis results.
etc., etc., etc.

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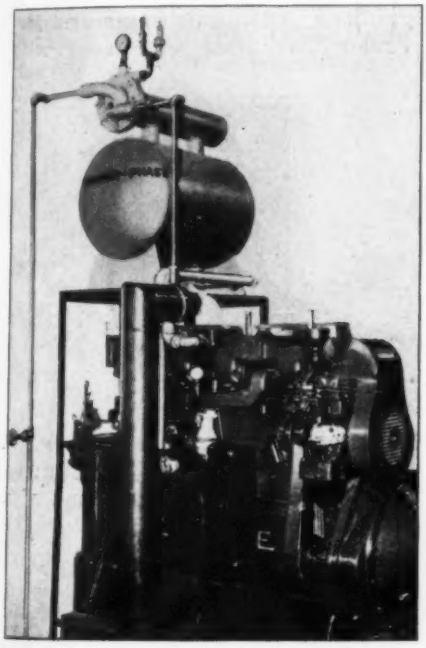
MANUFACTURERS' and EQUIPMENT News

Vapor-Phase Cooling System for Combustion Engines

Vapor-phase cooling for internal combustion engines is a system of waste heat recovery that undoubtedly will be new to most persons in the water works and sewerage field. No engine plant is too small, none too large, to be equipped with "vapor-phase" cooling and waste heat recovery. Multiple engines can be connected to a single system. The system is of value in maintaining uniform high temperature regard-



less of engine load or atmospheric temperature. The system eliminates crankcase sludge, reduces cylinder wear and increases the life of rings and valves. It is particularly well suited in the use of so-called "sour gas" or high sulphur gases.

"Vapor-phase" recovers 50 per cent of the total engine heat input in the form of low pressure steam at 5 to 25 pounds pressure. This cooling system has been applied to various makes of engines of both two- and four-cycle, vertical and horizontal, with bore sizes of 3 to 16 in., burning diesel oil, natural gas,

Yes, the Royer Sludge Disintegrator brings down three birds, because this inexpensive machine

1. Eliminates the cost of sewage sludge disposal.
2. Provides sewage treatment plants with a steady source of revenue from fertilizer sales.
3. Helps to increase America's food production.

When you burn or bury the sludge from your drying beds, you are wasting something which you can sell at a worthwhile profit as fertilizer, when it is properly prepared. America's increased food production program calls for more fertilizer. Every fertilizing material, including sewage sludge, must be utilized.

The Royer disintegrates sludge cake from the drying beds, thoroughly aerates and further dries it; at the same time eliminating trash from the sludge. It automatically discharges onto pile or truck a valuable and marketable fertilizer, from which hundreds of sewage treatment plants are deriving an appreciable revenue. Some Royer users mix chemicals with the sludge in the machine, producing a high grade fertilizer, which sells at a greater margin of profit.

Model "S-Jr." preparing sludge at Verona, N. J. Sewage Treatment Plant.

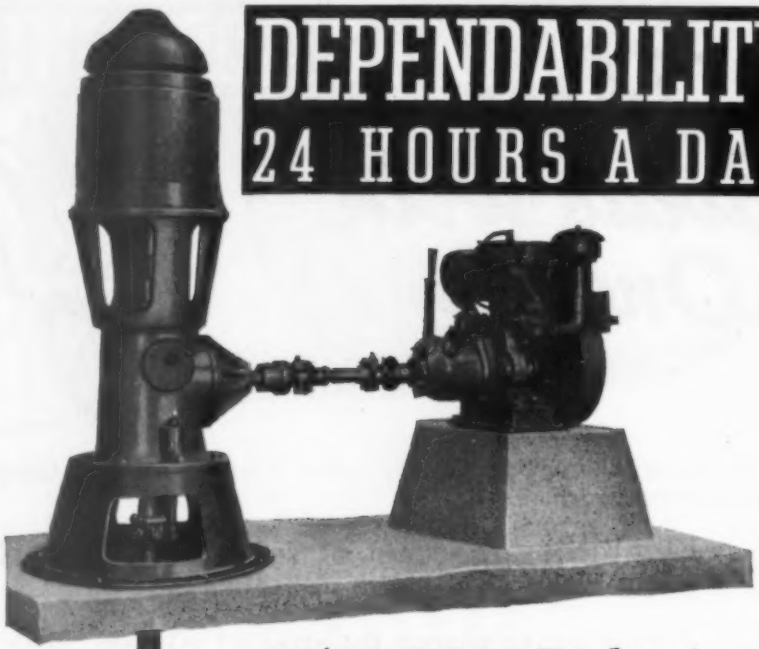
The cost of the Royer is so moderate that it soon pays for itself. Very little maintenance is required. It is also used for mixing top dressing for parks and municipal golf courses.

Royers are available in 12 portable and stationary models; electric motor, gasoline engine and belt-to-tractor driven.

Write for new bulletin showing what the Royer is doing for sewage disposal plants.

THE ROYER

ROYER FOUNDRY & MACHINE CO.
170 PRINGLE ST., KINGSTON, PA.



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★ SEWAGE ★ WATER WORKS ★
FIRE FIGHTING ★ FLOOD CONTROL

The Johnson Right-Angle Gear Drive is used as a "connecting unit" between the pump and the power unit. Illustration shows a combination application. These drives are manufactured in a variety of types and sizes, each designed to meet the specifications of a wide range of applications—Sewage Disposal; Water Supply; Fire Fighting; Flood Control; etc.

★ EFFICIENT ★ DEPENDABLE
★ ECONOMICAL ★ COMPACT
★ FULLY ENCLOSED ★ LONG LIFE

The Johnson Right-Angle Gear Drive is sold through Pump and Engine Manufacturers—their local representative will explain the many advantages of this drive which is used by scores of municipalities. Write for Catalog No. 12.

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RATE RECORDER FOR WATER METERS
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sludge gas, oilfield sour gas, butane and gasoline fuels. No engine changes are necessary to install the system.

Whereas 74 per cent of the fuel is wasted in internal combustion engines with conventional cooling systems, the "vapor-phase" system is said to recover two-thirds of this waste. Cooling increases the mechanical efficiency of the engine as much as 10 per cent at full load and twice that much at half load. This system of "vapor-phase" cooling is pictorially described in Bulletin WH-200 of the Pacific Enterprise Products, Inc., 2833 E. 11th St., Los Angeles, Cal.

Diamond Makes Fraley Vice-President and Director of Sales

J. T. Richards, president of Diamond Alkali Co., has announced the appointment of Fred W. Fraley as vice-president and director of sales. Mr. Fraley will be in charge of all sales operations of the company. A graduate chemical engineer, Mr. Fraley has been associated with

F. W. Fraley

Diamond Alkali for the past fifteen years and has the background of a broad and active experience in the alkali-chlorine industry.

Peake Made Ass't General Sales Manager by Mathieson Alkali

Mathieson Alkali of New York has announced the appointment of J. B. Peake, formerly New York district sales manager, to the post of assistant general manager of sales. In his new capacity Mr. Peake will be assistant to D. W. Drummond, general manager of sales.

A native of Norfolk, Va., Mr. Peake graduated from Washington and Lee University in 1915, where he was a member of Sigma Nu fraternity. During World War I he served as first lieutenant in the Coast Artillery Corps as aerial ob-

server. He joined the New York office of Mathieson in 1920, later being transferred to the Charlotte, N. C., district sales office from which

J. B. Peake

point he opened up the Southwest territory. Subsequent posts held by Mr. Peake at various times were district sales manager for the Chicago, Cincinnati and New York territories.

Foster Made Pittsburgh Equitable Sales Head

Announcement has been made by Major A. E. Higgins, vice-president of the Pittsburgh Equitable Meter Co., who is now in active service in

D. D. Foster

the Army Air Corps, of the appointment of Donald D. Foster as assistant sales manager.

Mr. Foster formerly was district manager for the Pittsburgh territory. In his new capacity he will be acting head of the sales divisions for both the parent concern and subsidiary, the Merco Nordstrom Valve Co. He is a native of Pittsburgh and a graduate of Carnegie Tech.

Walker Becomes Manager of Transite Pipe Sales for N. Y. District

James G. Walker, prominent in the civil and structural engineering field, has recently been appointed manager of the transite asbestos pipe department for the New York sales district of Johns-Manville.

CRAFTSMANSHIP AT ITS BEST
HILL-HUBBELL PIPE PROTECTION IS MODERN CRAFTSMANSHIP
Write today for detailed information contained in "THE BOOK OF PIPE PROTECTION".
Cellini, Robbia and Donatello were the recognized artists craftsmen of their day. Their fine jewelry and armor design are still tops in the skilled arts.
But the SKILLED CRAFTSMANSHIP in HILL-HUBBEL Pipe Protection does a more practical job. It conserves the long, useful life of Steel Pipe in the gas, oil and water industries where planned transportation is so important.
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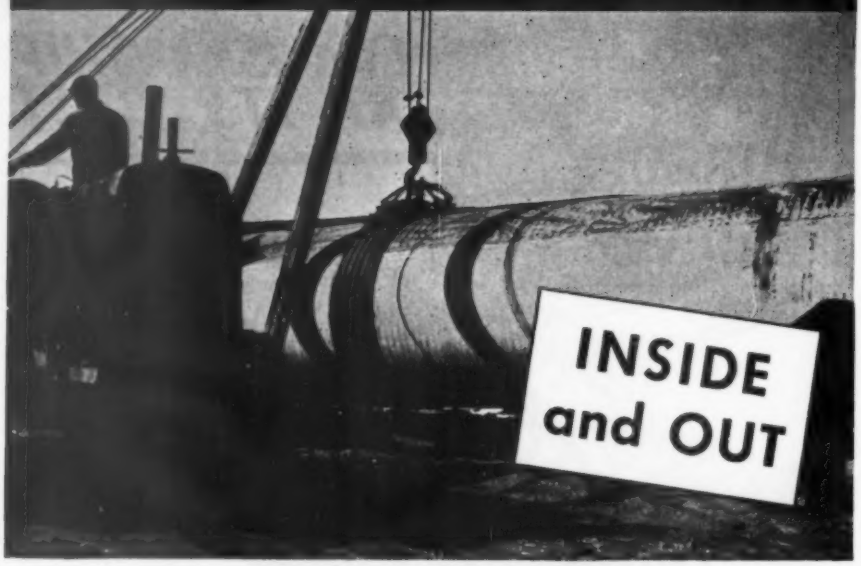
The Perfected Method for Making
SEWER PIPE JOINTS OF CEMENT
• No jute used—gasket centers spigot.
• Definite space in each joint for cement.
• Form confines cement-grout to lower portion of joint.
• Particularly advantageous in water-bearing trenches.
• Infiltration minimized.
L. A. WESTON Adams, Mass.

Dependably Protected



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☆ The tough, durable REILLY coating gives steel water lines dependable protection against corrosion from moisture, electrolysis, soil acids, and alkalies. It resists abrasion and soil stress, and is unaffected by extremes of temperature. . . . As an inner lining, REILLY Enamel protects against incrustations and tuberculation, and assures full capacity flow for the life of the pipe. On storage tanks, structural steel work and other exposed metal surfaces, REILLY Coal Tar Paints give dependable and economical protection.

Booklet describing REILLY *Protective Coatings will be sent on request*

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SEVENTEEN · PLANTS · TO · SERVE · YOU

A native of Lowell, Mass., his technical training includes two years at Holy Cross Univ. and four years at M.I.T.

After graduation he served as engineer for several large construction

J. G. Walker

companies and for the Portland Cement Association.

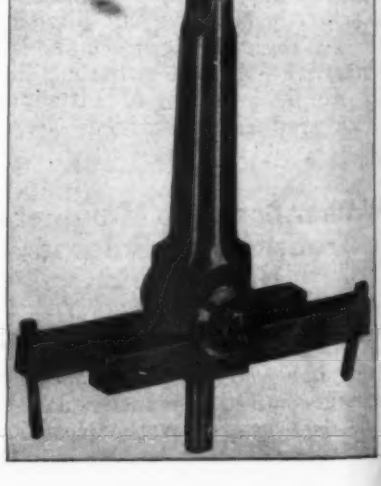
In 1928 he was employed by the Alpha Portland Cement Co., where he served in an engineering sales capacity until joining Johns-Manville.

Among the many organizations with which Mr. Walker is affiliated are the Engineers Club of New York, the Technology Club of New York, the American Society of Military Engineers, and the "Moles."

New Clark Adjustable Fly Cutter

The Robert H. Clark Co. of Los Angeles announces the new Clark fly cutter for cutting holes or discs in metals of thicknesses up to one inch, including boiler plate, stainless steel, cast iron, plastics, and other "problem" materials. It is useful for cutting large taps in cast-iron and steel pipe, tanks, etc.

The tool (illustrated) is obtainable with straight or tapered shank and covers expansions of 4 inches to 10 inches in diameter, including all



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DIAPHRAGM PUMPS

Hand Sizes 2", 2½", 3", 4"
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Edson Special Suction Hose
Red Seal Diaphragms
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SAVE MONEY USE ACTIVATED ALUM and BLACKALUM

STUART-BRUMLEY CORP.
316 North Charles St.
Baltimore Maryland

decimal or fractional intermediate sizes.

The Clark line also includes other models for cutting diameters of ⅝ to 5 in.

The bits in all of these tools can be easily re-ground or can be replaced with new bits at comparatively small cost, thus lengthening the life of the tools indefinitely.

Anyone desiring to obtain specifications and prices should write to the Robert H. Clark Co., 3424 Sunset Blvd., Los Angeles 26, Calif., for their new literature embracing all sizes of these tools.

Fritz Ziebarth Now Producing Aeroplanes

Fritz Ziebarth, head of the Long Beach contracting and construction firm bearing his name, and best known to our readers as builder of dams, water supply and sewage works, has recently taken over the operation of the Morrow Aircraft Corp. at Rialto, Calif.

Fritz Ziebarth

This newest war activity of the Ziebarth organization is added to that of shipbuilding and other assembly line production enterprises. The Morrow Aircraft Corp. pioneered in the development of the "plastic" plane, having engineered the moulded plywood "Victory Trainer" from the ground up.

Everson Appoints Five Representatives

The Everson Mfg. Co., Chicago, has recently announced the appointment of several manufacturer's representatives to handle Everson chlorine control and swimming pool equipment. These new appointments include: B & B Engineering Supply Co., Inc., Houston; Charles H. Alexander & Son Co., Grand Rapids, Mich.; J. Edwin Aspinall, Indianapolis, Ind.; J. D. Homan, Tampa, Fla., and R. W. Rassbach, Washington, D. C.

Zechariah Chafee, Builders-Providence President, Dies at Age of 84

Zechariah Chafee, for more than forty years president of Builders Iron Foundry, died at the age of 84 after a long and useful life to the manufacturing industry, the city of Providence and Brown University, of which he was an alumnus.

The esteem in which Mr. Chafee was held by his fellow townsmen is evidenced in the following comments quoted from the newspaper accounts of his passing: "In the death of Zechariah Chafee, Brown University lost one of its most devoted alumni. . . . He was representative of the distinguished line of New England manufacturers who took pride in running a successful industry and keeping their workers continuously employed, turned out a sound and honest product, and engaged in activities which promoted the community's welfare. . . . Although he never held public office, he took a strong and independent interest in politics and expressed his views effectively. He served in the militia, on boards of various charitable institutions, was a member of the R. I. Fuel Com. in World War I, was

HE MAKES SOLIDS GO . . . WHERE THEY OUGHT TO

Rex Mechanical Engineering—Rex M. E.—has learned from years of experience with screenings problems that to be efficient, a bar screen must provide a large area of screening surface and a straight unobstructed channel ahead and behind the rack.

In his design of the Mechanically Cleaned Bar Screen, Rex M. E. left no place for solids to accumulate except on the rack—chains are guarded, sprockets streamlined. Each passage of the accurately-cut rake teeth cleans the bar rack positively and completely. The rake will handle any size solids—discharge them at any desired height above the rack. The rake is rigidly mounted so that it cannot slide over accumulated screenings.

Rex M. E.'s Bar Screens are in use in many plants. Their reputation for successful service is widely recognized. The universal demand by consulting engineers for Rex M. E.'s services and equipment are the best recommendations that he can have.

He and his staff of trained experts are always at your service. If you have a screening problem, see your Rex Man or write direct to Rex M. E., Chain Belt Company, 1610 West Bruce Street, Milwaukee 4, Wisconsin.

REX **SANITATION EQUIPMENT**

Triturators • Bar Screens • Tow-Bro Sludge Removers • Slo-Mixers
Aero-Filters • Rapid Mixers • Grit Collectors and Washers

CHAIN BELT COMPANY *OF MILWAUKEE*

Member of the Water and Sewage Works Manufacturers Association, Inc.

Economical-Effective Durable

SERVICISED
SEWER PIPE JOINTING COMPOUNDS

HOT POURED COMPOUND

Servicised Sewer Pipe Jointing Materials have served in the sewerage field through many years.

Our Hot Poured Compound is specially prepared for vitrified clay pipe used in sanitary sewerages.

Servicised Hot Poured Compound is quick setting and produces tough, flexible, long lasting joint connections. This material is shipped in Fiber Drum Containers that open very easily.

TUFFLEX . . . is a cold premixed troweling plastic material that is also widely used in jointing of vitrified clay pipe.

TUFFLEX is especially outstanding for use in wet trenches because the material will set under water, thereby assuring continuous pipe jointing.

The adhesive and cohesive qualities of this excellent compound are resultful in a highly waterproof and root repelling product.

Save time and labor cost by speeding up sewer pipe jointing with TUFFLEX. This material arrives on the job for immediate use.

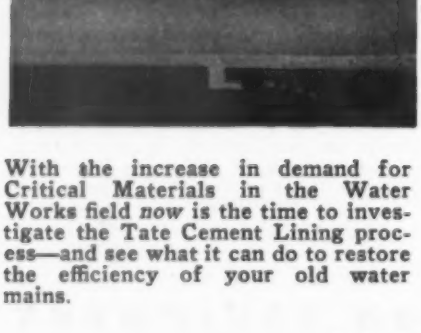
Millions of pounds of Servicised Sewer Pipe Jointing Materials have been used throughout the country on Federal and Municipal Projects.

Pioneers in the Manufacture of Approved Construction Materials for Over 23 Years
SAMPLES AND DESCRIPTIVE LITERATURE WILL BE SENT UPON REQUEST

SERVICISED PRODUCTS CORP.
6051 West 65th Street, Chicago, Ill.

View showing Tate Process in Pipe Joint. Note thoroughness of Lining.

Help Save Critical Materials · investigate **TATE Cement Lining Process**



With the increase in demand for Critical Materials in the Water Works field *now* is the time to investigate the Tate Cement Lining process—and see what it can do to restore the efficiency of your old water mains.

THE TATE PROCESS ACCOMPLISHES

1. Water mains cleaned and cement-lined without removing pipe.
2. Eliminates discoloration and further cleaning costs.
3. Reduces pumping costs.
4. Restores reduction in head and flow co-efficients. This means full fire protection and lowered insurance rates.
5. All Joints cement-lined . . . eliminates bacteria in joints.
6. Does the job with minimum interruption of service to consumer.

Write for Literature

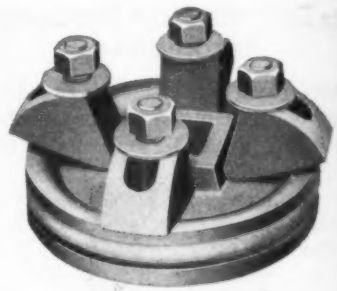
TATE PIPE LININGS, Inc.
ANDOVER, MASS.

active in church organizations and perpetual secretary of his university class. He is survived by four sons and two daughters." His successor as president of Builders-Providence has not been named.

A Plug for Main Ends

Useful in Testing, Running Temporary Lines, Construction and Blocking Dead Ends

The Clow-National Test Plugs for water-tight closure of main ends, in making tests for tightness of joints after laying, as the work progresses,



also have several additional applications in everyday waterworks practice.

Essentially the Clow-National Test Plug consists of two circular plates between which is a thick highly elastic rubber gasket. When inserted in the bell end of a cast-iron pipe the four compression bolts are loose. The slide lugs are then slipped over into the jointing groove of the bell, and the bolts tightened. The result is the squeeze of the gasket between the plates, which expands the rubber to make a "bottle-tight" contact with the bell wall. The lugs, of course, hold the assembly against possible blow-out under the highest pressure, and even water-hammer heads.

Each plug is tapped for pressure pumps connection or live take-off connection, and a smaller tapping provides for air release or small line take-off. It is evident that such plugs have several possible uses in addition to that of main testing for leakage. Amongst such uses are the running of jump-lines around repair work; for temporary supply lines during main cleaning or cement lining in place by the Tate Process; closure of dead ends, with bleeder connection for maintaining fresh water therein for prevention of freezing—and many other possible applications in everyday water works, operation and maintenance practice.

These Clow-National Test Plugs

(A-1282) are now available for all sizes of Standard B.&S. pipe from 3 to 12 inch inclusive. For additional information and prices write James B. Clow and Sons, 201-299 North Talman Ave., Chicago, or the National C. I. Pipe Co., Birmingham, Ala.

Farris Establishes Valve Repair Division

The Farris Engineering Co. of Ridgefield, N. J., has announced the establishment of a new division to handle valve repairs. Facilities of the department include complete testing apparatus and equipment to speedily recondition and reconstruct all types of reducing, relief, standard and special valves and control apparatus. The department is manned by skilled mechanics engaged in the actual manufacturing of valves. Plant engineers and maintenance men who are troubled with the difficulties of replacing or repairing leaking and worn valves should address inquiries to the Farris Engineering Co., Ridgefield, N. J.

More Production Awards

In the last few weeks the War Department has announced 102 additional awards of the Army-Navy production "E." Among the recipients are the following whose names are familiar in the field of water and sewage treatment:

Allis-Chalmers Mfg. Co. (LaPorte, Ind., plant).

Link-Belt Co., Chicago, Ill.

General Electric Co. (plastics dept., Pittsfield, Mass.).

United States Pipe & Foundry Co., Birmingham, Ala.

Difco Laboratories, Inc., Detroit, Mich.

Monsanto Chemical Co. (plastics div., Springfield, Mass.).

Sloan Valve Co., Chicago, Ill.

We have also received a brochure on the raising of the "E" flag at the Badger Meter Mfg. Co. Milwaukee plant, and pictures of the award of the gold star for the Maritime "M" flag to the Homestead Valve & Mfg. Co., Coraopolis, Pa.

Other manufacturers in the water and sewage field who have recently held ceremonies at which the production award was made include the Niagara Alkali Co., Niagara Falls, N. Y., and the Dow Chemical Co. Great Western Division, Pittsburg, Cal.

A star has also been added to the "E" flags of the Wallace & Tiernan

SMITH
TAPPING SLEEVES

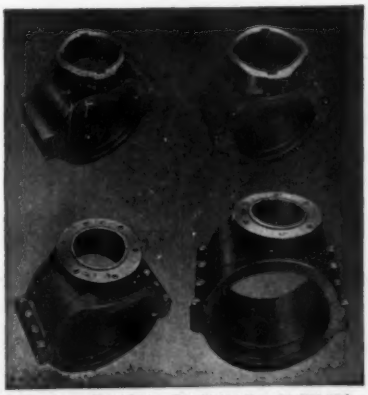
THE A.P. SMITH MFG. CO. EAST ORANGE, N.J.

Symbol of Quality Since 1889

MAKING PRESSURE CONNECTIONS
Without Stopping the Service

SMITH Tapping Sleeves for making pressure connections to A.W.W.A. standard mains, classes A, B and C, and for pressures up to 150 lbs. per square inch, are made in four types, here illustrated. At top: 1. Clamped Sleeve Joint; 2. Bolted Sleeve Joint. Bottom row; 3. Bolted Sleeve Joint with flanged end joint valve connection; 4. Hackensack Sleeve Joint with flanged end joint valve connection.

OTHER SMITH PRODUCTS
Valves and Hydrants — Valve Inserting Machines — Tapping Sleeves — Tapping Valves — Hat Flanges and Water Meters
Write for Catalog



A. P. SMITH TAPPING SLEEVES

Branches
7 So. Dearborn St., Chicago, Ill.
409 Texas St., El Paso, Texas
315 N. Crescent St., Flandreau, S. D.
901 Wm. Oliver Bldg., Atlanta, Ga.
Thirteenth & Broadway, Oakland, Calif.
524½ First Ave. S., Sattle, Wash.
1317 Oakley St., Orlando, Fla.

THE A. P. SMITH MFG. CO., EAST ORANGE, N. J.

Tegul-
IMPROVED JOINTING COMPOUND
MINERALEAD
for Bell & Spigot Main

- Sulphur base; quick sealing, speeding laying and backfilling.
- 10 lb. ingot form, easily handled, stored and shipped. Impervious to rain. Cannot change composition.
- Makes permanently tight joints. Goes 3 to 5 times as far as lead, helping conserve a strategic war metal.
- For money-saving information, write

The ATLAS MINERAL Products Company of Pa.
Mertztown Pennsylvania

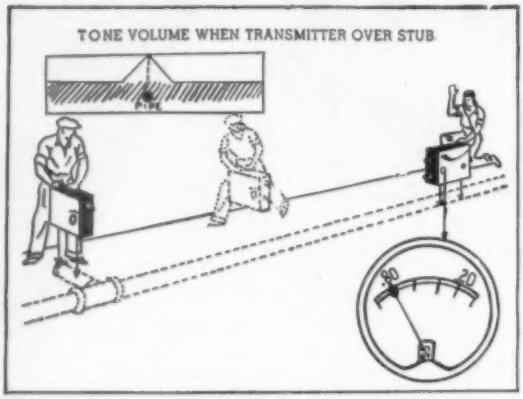
BAILEY METERS AND CONTROLLERS
FOR SEWAGE TREATMENT AND WATER SUPPLY . . .

● Venturi Tubes, Weirs, Flumes, Nozzles and other primary elements; Mechanically and Electrically operated Registers and Complete Automatic Control Systems.

BAILEY METER COMPANY
1072 IVANHOE ROAD • CLEVELAND O.
Bailey Meter Co. Ltd., Montreal, Canada

M-SCOPE

BURIED PIPE AND CABLE FINDER



ONE USE OF THE M-SCOPE: FINDING A STUB

When making new house connections, water works men often encounter a real problem:—**locating a stub** which was placed in the vicinity years ago for that very purpose.

With an M-SCOPE It's easy:—Two men—one carrying the transmitter and the other the receiving set—walk along until the presence of the stub is announced by the louder ringing of the earphones and the higher reading on the meter indicator. **For further particulars, write for booklet.**

The M-SCOPE has many uses:

It quickly locates the eact position of underground pipe lines, pipe bends, dead ends, valves, cast iron bells, stubs, service connections, covered manholes, obstructions in sewers, etc.

It determines the deph of a pipe line or metallic conductor.

It traces the exact course of an underground line.

It eliminates needless tearing up of pavement and long and arduous digging at the spot or spots where the men think the hidden pipe, stub, valve or obstruction **might** be. It therefore saves three valuable commodities—labor, materials and money.

Watch for the Series of Monthly Advertisements in **W-W-&-S** Regarding Use of the **M-SCOPE.**

FISHER RESEARCH LABORATORY

Direct Teletype by Postal Telegraph PALO ALTO, CALIF.

SEWAGE PLANT OPERATORS....

Are you trying to speed up plant capacity to meet the problem raised by an influx of war worker population?

This can be done by using a modern Coagulant.

Many plant operators are getting faster treatment through the use of Ferri-Cl_3or . . . an up-to-date coagulant especially designed to give faster, more efficient sewage treatment.

FERRIC CHLORIDE

Write for more information about

Ferri-Cl_3or

INNIS, SPEIDEN & COMPANY

Established 1816

117 Liberty Street . . . . . NEW YORK

CHICAGO • CLEVELAND • CINCINNATI

BOSTON • PHILADELPHIA • GLOVERSVILLE, N. Y.

Co., Inc., and the Wallace & Tiernan Products, Inc., and the Lynchburg Foundry Co. has received two Maritime "M" flags for its Lynchburg and Radford, Va., plants.

From the growing list of awards, it is obvious that manufacturers normally engaged in the production of supplies for the water and sewage field have taken their place in production for war.

Marcello King Joins Worthington

Worthington Pump & Machinery Corp. recently announced that Marcello A. King has joined the organization as executive engineer of its Moore Steam Turbine Division, Wellsville, N. Y., in charge of design, research, testing and service. Engaged in turbine engineering and manufacture since his graduation from the University of Michigan in 1916, he was with the Kerr Turbine Co. and later with the Elliott Co., where he held the position of manager of engineering.

Recent Bristol Appointments

Peckham, Made Mgr. of Development and Nuber, Pacific Coast Manager

The Bristol Co. of Waterbury, Conn., has announced the appointment of J. W. Peckham as manager of the development and design department and E. Nuber as manager of the Pacific Coast branch offices and factory.

Peckham was graduated in electrical engineering from Rhode Island State College in 1921, after which he joined the radio research department of General Electric Co. In 1922 he joined the Bristol radio engineering department. In 1940 he was appointed Pacific Coast district manager in charge of the Pacific Coast branch offices and San Francisco branch factory. He will make his headquarters in Waterbury, Conn.

Peckham Nuber

Nuber studied electrical engineering at Brooklyn Polytechnic Institute after which he was associated

with the New York Edison Co. and later with the Western Electric Co. and the Board of Transportation of New York City. He joined the Bristol Co. in 1929 as sales engineer and before being appointed as Pacific Coast district manager was manager of the Akron branch office and factory.

New Laboratory Equipment

In the last two issues of "The Laboratory" published monthly by the Fischer Scientific Co. of Pittsburgh, appears information of interest on new laboratory equipment and supplies.

Ready packaged, weighed amounts of soluble starch, is an example of the system developed in Eimer and Amend's (Fischer owned) chemical laboratory to package small amounts of chemicals for specific laboratory uses. The advantages of chemicals put up in this way are obvious. No time is lost in weighings. No large container is left open and subject to contamination. Each Gram-Pac contains one gram of E&A Soluble Starch. When the content of one Gram-Pac is emptied into the bottle it is filled with hot distilled water, shaken, and the indicator is ready for use.

A new method for the determination of chlorides in water has been developed by Fischer using the Fischer Senior Titrimeter, and silver-silver chloride electrodes.

For laboratory analysts who want to seal glass, wood or metal, Fisher's new "Pyseal" sealing cement is furnished in a box containing two sticks 7 inches long weighing 1½ oz.

Tempils and Tempilsticks are convenient means of determining the temperature in ranges from 125 to 1600 degrees F. The Tempil pellets are marked in 50 deg. steps from 750 to 1600 deg. For persons who wish to know just how hot a muffle actually is, these pellets will be useful in the absence of a thermocouple and recording or indicating device.

Laboratory stills can now be treated to insure efficient continuous operation with the production of purer distilled water. The treatment is a new application of an organic water conditioner, known as K.A.T. An anti-scale, anti-corrosion, and anti-foaming agent, K.A.T. forms a protective coating on the inside of the still and at the same time forms a sheath on the impurities in the water thereby producing an easily removable sludge. This colloidal organic material does not carry over. A minimum of two ounces per day

DEPENDABLE IN THE PINCHES!

QUIMBY PUMPS

PORTER "Better Built" Equipment Established 1866

★ SKILFULLY ENGINEERED
★ RUGGEDLY CONSTRUCTED
★ GENEROUSLY PROPORTIONED

Quimby Screw, Rotex, Centrifugal, and Chemical Pumps are designed and built on the principle that a pump's main function is to perform its job with unfaltering constancy. As a result, emergency failure of a Quimby Pump is a rare event.

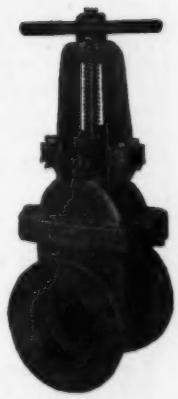
QUIMBY BUILT MEANS BETTER BUILT

QUIMBY PUMP COMPANY
INCORPORATED
DIVISION H. K. PORTER COMPANY, Inc.
PITTSBURGH (1) PENNSYLVANIA

Will you be ready when PEACE *eliminates* PRIORITIES?

There's probably a long, hard struggle ahead but peace will come—and it is both patriotic and sensible to start work now on your plans for the future.

For that POST-WAR PROJECT specify RENSSELAER for the utmost in dependability.



RENSSELAER VALVE CO.
TROY, N. Y.

84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 1" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

75 Federal St., Boston

UP-TO-DATE REPORT . . .

on the occurrence, movement and work of the earth's waters

For the first time the results of the vast research of recent years on the natural waters of the earth are made available in a single, authoritative volume. Another monumental contribution to the literature of geophysics by the National Research Council, this work is the newest volume in the Physics-of-the-Earth Series. Twenty-four specialists cover every phase of hydrology to give you an idea of its present status.

Just Published!

HYDROLOGY

Edited by Oscar E. Meinzer

Geologist in Charge, Division of Ground Water, United States Department of the Interior

712 pages, 6x9
many illustrations, charts, tables.

$7.50

This book brings you full information on the waters of the earth—excepting the oceans—and the development, status, and problems of the science relating to them. Presents the known facts, principles and laws involved in the course and function of all these waters throughout the hydrologic cycle — covering rain, snow, glaciers, rivers, lakes, soil moisture, and the deeper subterranean waters.

PREPARED UNDER THE DIRECTION OF THE NATIONAL RESEARCH COUNCIL

Includes new data on:

- snow and snow surveying
- Hydrology of glaciers
- transpiration and consumptive use
- infiltration
- runoff
- Hydraulics of ground water
- history of hydrology
- etc.

Order from

WATER WORKS & SEWERAGE

330 So. Wells Street — Chicago, Illinois

for stills of one- or two-gallon capacity per hour. It is simple to use and inexpensive.

Further information on any of these products may be obtained from The Fischer Scientific Co., 717 Forbes St., Pittsburgh, Pa.

New Rubber Sponge

The B. F. Goodrich Company has developed a synthetic rubber sponge which will stay soft and compressible at temperatures down to 40 degrees below zero (—40°F.).

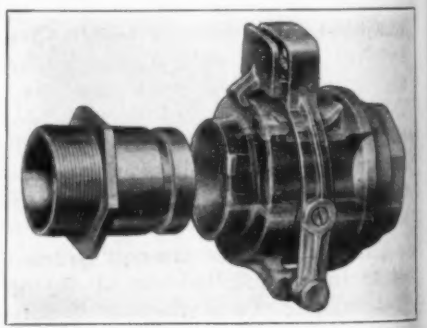
Of medium density, the new sponge, satisfactory for many wartime as well as peacetime uses, is made in black color and can be furnished in slabs or molded shapes.

Cochrane Appoints New Representatives

Cochrane Corp., Philadelphia has recently announced the appointment of two new representatives, one in Detroit and one for California, Western Nevada and Arizona. The Metrol Co. headed by Robert A. Wright is the flow meter representative for the Detroit Area and the Bushnells Controls and Equipment Co., headed by B. O. Bushnells in Los Angeles will be Cochrane's new Western representative for flow meters and controls.

Wiggins Quick Disconnect Couplings

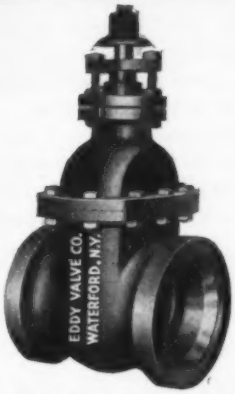
New applications of the Wiggins Quick Disconnect Couplings are constantly being made by industrial designers, engineers and technicians, in the handling of all fluids as well



as compressed air and vacuum. Because of instantaneous release much time is saved.

Industrial and Marine Couplings from 2 in.-10 in. in size are disengaged by releasing a latch and throwing a lever. Connection is made by placing the two ends of the coupling together and raising the lever—all of which takes considerably less time

EDDY
FIRE HYDRANTS
AND VALVES—
WATER WORKS EQUIPMENT



EDDY VALVES
For
Water Works
and
Sewage Disposal
Plants

EDDY VALVE CO.
Waterford, N. Y.

EDDY FIRE
HYDRANTS
For Fire
Protection
Service

Write for Complete Catalog

Eddy
VALVE COMPANY
WATERFORD, N. Y.

than the telling. No bolts to tighten, no threads to match, no tools to use mean speed and convenience in all weather conditions. The couplings are all made in accordance with Federal Specifications and the larger sizes are individually tested for pressure and porosity. Sizes ¾ in. to 2 in. are die cast from Zamak and larger sizes are machined from brass or aluminum.

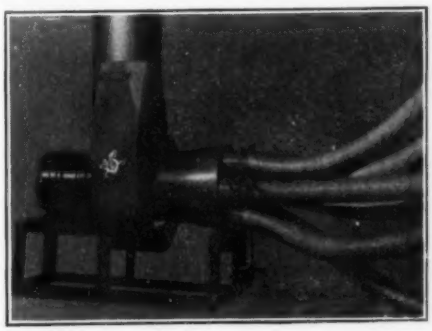
For catalog or information on special designs or adaptations write to Engineering Department, Wiggins Quick Disconnect Coupling Divisions, E. B. Wiggins Oil Tool Company, Inc., 3424 East Olympic Boulevard, Los Angeles, Calif.

Cochrane Appoints Stone in Western New York

Cochrane Corp., Philadelphia, recently announced the appointment, as flow meter representative, of Roy L. Stone, with offices in the Commerce Building, Rochester, and 295 Hartford Ave. (Kenmore), Buffalo (under V. J. Williams). This organization also handles Hays combustion controls and Reliance gauge columns, thus offering complete instrumentation service.

Improved Fume Exhauster by Chelsea

A new and improved Fume Exhauster developed by the Chelsea Fan and Blower Co., of Irvington, N. J., is designed so that fumes, gases, dust filings, and grinding compounds do not come in contact



with the motor. The centrifugal type blower wheel is made of ⅛-in. steel, with ball bearing motor tested to overload capacity. A welded framework has handles for carrying, and adapters are interchangeable and can be used for suction or blowing as desired.

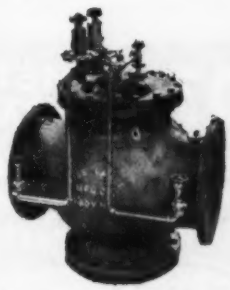
This type exhauster is useful in removing explosive or poisonous gases from various parts of sewage treatment plants and general ventilation. A bulletin on the unit may be obtained from the Chelsea Fan and Blower Co., 1206 Grove St., Irvington, N. J.

· 1879 ·
ROSS
AUTOMATIC VALVES

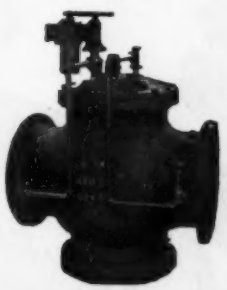
ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES

FLOAT VALVES • REDUCING AND REGULATING VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.

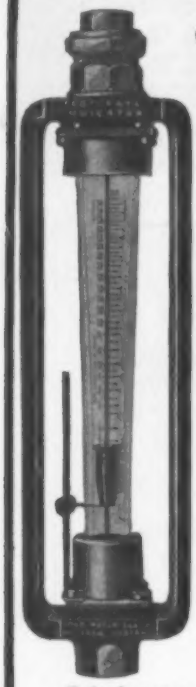


COMBINATION VALVE
Combination automatic control both directions through the valve.
A self-contained unit, with three or more automatic controls.



REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.



Testerate INDICATOR

Knowing the rate of flow in meter testing is almost as important as knowing that your tanks or scales are accurate. The Ford Testerate Indicator will tell you instantly and accurately the rate of flow in gallons per minute. Hundreds of these instruments are in service.

Ask for more information.

FORD METER BOX CO.
WABASH, IND.

WRITE FOR INFORMATION

VOGT BROTHERS TRAFFIC MODEL FIRE HYDRANT

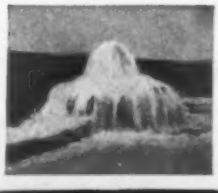
A.W.W.A.

VOGT BROTHERS MFG. CO. Incorporated
MAIN AT 14th LOUISVILLE, KY.
VOGT
VOGT MFG. CO., Incorporated
P. O. BOX 1122 LOUISVILLE, KY.

AERO-MIX AERATOR-MIXER

AERATOR—MIXER

A Size and Type to Fit Your Problem in Water or Sewage Treatment.



WRITE FOR INFORMATION

LITERATURE AND CATALOGS

"Pipe Pointers" from Crane Co. constitutes the subject matter of five new illustrated Crane bulletins. In the first is shown piping pointers to keep equipment on the job, with examples of good and bad, or right and wrong ways to do pipe fitting. The second bulletin states that good piping service begins with good installation, and shows safe and unsafe, good and bad, right and wrong methods for the installation of pipe fittings, valves and pressure relief units. In the third bulletin the reader is told how to pick valves which will be "kind" to piping. Features of design and proper operation of different types of valves are shown. The fourth bulletin says "it's the trim that counts" in keeping valves on the job. This bulletin is a selection table, showing the kind of valve (iron, steel, brass), the type of trim (disc and seat), its availability, and the suitability of each specific trim for different kinds of service. The fifth bulletin in the series tells how to repair valves to get renewed life from gate and globe valves or to conserve critical materials. Good clear pictures and captions illustrate each point as to methods of repair for different parts of valves. These very timely and useful "Pipe Pointers" may be obtained by requesting these new bulletins from Crane Co., 836 S. Michigan Ave., Chicago, Ill.

American Equipment—The American Well Works of Aurora, Ill., has recently issued a series of eight new bulletins describing equipment for use in the field of water and sewage treatment.

Bull. No. 249 on **Grit Removal** describes two methods for the separation of grit, namely, the grit channel equipped with a Camp regulator device, and grit settlers for short period settling tanks. Curves for different channel sections are given.

Bull. No. 251 presents the design features and specifications on the American **Single Stage Centrifugal Pumps**, Fig. 3500.

Bull. No. 252 on **Iron and Carbon Dioxide Removal** by the Ferrofilter was reviewed in the June issue of WATER WORKS AND SEWERAGE.

Bull. No. 253 on **Sludge Removal** contains information on the American Conveyor with the advantages of the Cantilever Idlers, American Sludge Control Valves, and Multi-

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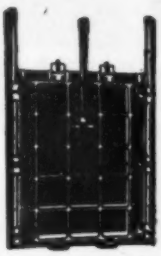

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ple Hoppers. Design details are given for double flow tanks in municipal and industrial applications.

Bull. No. 254 describes the **American Aerators** in the activated sludge process; the installation, operation, sludge return, circulating unit, and tank design data. An abstract of the principles of activated sludge plant design taken from SAN 2047-A is given, as is information on the two-stage activated sludge system.

Bull. No. 255 is a folder on **Mixing Equipment** for flocculation, recarbonation, aeration, and chemical mixing.

Bull. No. 256 on the **"Flocsettler"** describes the advantages and applications of this apparatus in single and multiple installations.

Bull. No. 258 on **Screens** contains a discussion of the advantages of pump screens of mechanical or hydraulic type, the use of the cutting pump and the methods of disposing of screenings.

These bulletins and supplementary information may be obtained by addressing a request to The American Well Works (W & S Division), Aurora, Ill.

"NO-OX-ID" Protective Coating and Water Stabilization are presented in two bulletins from Dearborn Chemical Co. which will be of interest to anyone troubled with rusting of equipment or anyone who is confronted with the problem of preparing a water for boiler feed purposes.

Bull. No. 3009 on **"No-ox-id"** was prepared especially for the railroad industry but it has applications to any industry where steel structures are subject to rusting. The bulletin contains the story of NO-OX-ID and the prevention of rust. Many pictures are shown with adequate descriptions to indicate the severe conditions under which this material will protect the steel structure. There are many places in water and sewage plants where this type of material should find extensive use to prevent rusting.

Bull. No. 1014 on **Stabilizer Finishing Treatment** describes how this treatment will improve boiler water by preventing scale deposits in distribution and feed lines, by preventing corrosion in boilers, by controlling foaming, and by cutting blowoff cost to one-third.

For further information on these products mentioned in Bull. Nos. 1014 and 3009, write the Dearborn Chemical Co., 310 S. Michigan Ave., Chicago, Ill.

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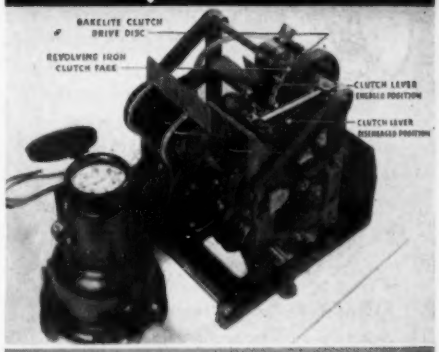
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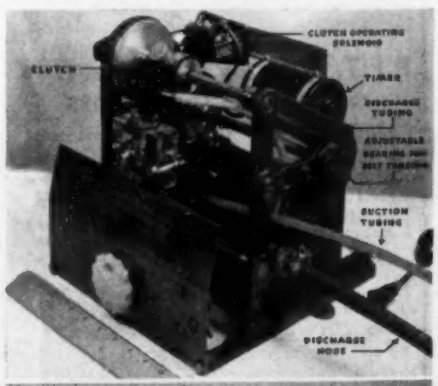

Front view of same model—cover removed.

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"Profits from Sewage Sludge" is the title of a new Royer bulletin which points out how the imminent need of maximum food production necessitates the use of more fertilizer, despite the fact that certain former sources of fertilizer are curtailed at present.

The fertilizing values in sewage sludge are explained and a list of crops and plants which, according to competent authorities, have benefited by the application of fertilizer made from sewage sludge is presented.

The bulletin points out how the sludge has been markedly improved for use by pulverization of the heavy bed cake by inexpensive easily operated Royer Sludge Disintegrators. Sludge cake from the drying beds is shoveled into the hopper of this machine, which thoroughly shreds, mixes, aerates and further dries the sludge, reducing it to pea size and at the same time removes sticks, stones and other trash. Where a high strength fertilizer is desired, enriching chemicals can be mixed with the sludge by this same machine. The bulletin further shows how the sludge disintegrator is used at city parks and golf courses for mixing top dressing and also at schools for

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A copy of this timely bulletin may be obtained by writing Royer Foundry & Machine Co., Kingston, Pa.

The Theory of the Rotameter is the title of new catalog 98-Y of the Fischer & Porter Co., Hatboro, Pa. A second section is entitled "Rotameter Capacities and Correction Factors." It has many unique features including an interesting and thorough discussion about the history and development of area-type flow meters. The "Analysis of Accuracy of Rotameters" is approached from a new and unusual viewpoint which will interest all engineers with flow rate problems.

Accompanying the text are many diagrams and illustrations which explain the inherent advantages of the Rotameter. The complete immunity of the Fischer & Porter Stabl-Vis Rotameter to viscosity changes over ranges encountered in industrial or water and sewage practices and the ability of this rotameter to give accurate gravimetrical readings regardless of fluid density changes are clearly portrayed. All the latest technical and engineering data about the Rotameter are included in this catalog, 98-Y, which may be obtained by writing Fischer & Porter Co., 954 County Line Road, Hatboro, Pa.

End Sewage Pump Clogging is the theme of Folder 32 of the Chicago Pump Co. whose "Flush-Kleen" sewage ejectors operate alternately and cannot clog because solids do not reach the impellors. Odors are absent, labor requirements are small and maintenance consists of only weekly lubrication.

Chicago "comminutors" installed ahead of sewage pumps, or at the entrance to sewage plants, provide continuous automatic screening and cutting of coarse sewage matter into small non-clogging settleable particles. Folder 32 recommends that any one interested in "Flush-Kleens" should write for Special Bulletin 122, and those interested in the "Comminutor" should write for Special Bulletin 185. Both of these bulletins may be obtained from the Chicago Pump Co., 2300 Wolfram St., Chicago (18) Ill.

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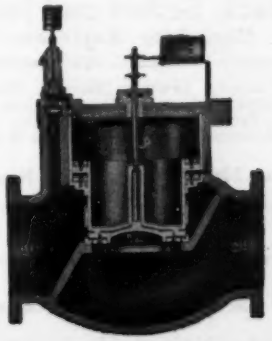
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Meetings Scheduled

(*Continued from page* 62)

Oct. 21-23—CHICAGO, ILL. (Hotel Sherman). **Central States Sewage Works Ass'n.** (Joint meeting with Federation Sewage Works Ass'n.) Sec'y-Treas., J. C. Mackin, Route 4, Madison, Wis.

Oct. 24-27—CHICAGO, ILL. (Hotel Sherman). **American Public Works Association.** (Annual Meeting). Exec. Sec'y, Norman Hebden, 1313 E. 60th St., Chicago, Ill.

Oct. 25-26—JEFFERSON CITY, MO. (Governor Hotel). **Missouri Water and Sewerage Conference.** Sec'y-Treas., W. A. Kramer, State Board of Health, Jefferson City, Mo.

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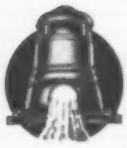

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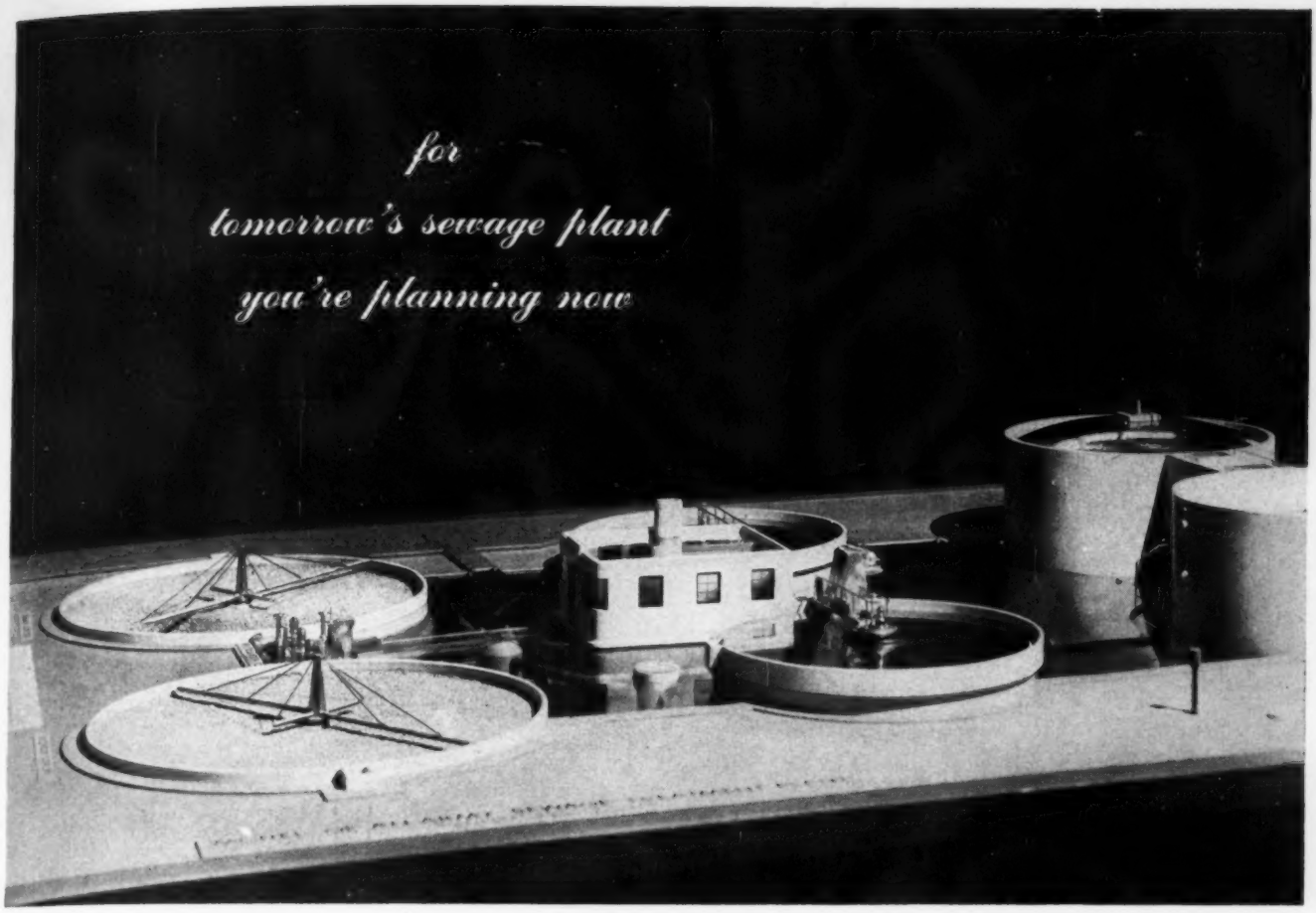

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